Nitrate, Silicate and Phosphate Atlas for the Gulf of St. Lawrence

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by

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Abstract

Brickman, D. and B. Petrie. 2003. Nitrate, silicate and phosphate atlas for the Gulf of St. Lawrence. Can. Tech. Rep. Hydrogr. Ocean Sci. 231, xi + 152 pp.

We have analyzed over 36 000 observations for each of nitrate, silicate, and phosphate to create a nutrient atlas for the Gulf of St. Lawrence. The statistics are strongly affected by the temporal and spatial distribution of the data: 65% of the observations occur in summer and fall, 50% are in the upper 30m, and 18% are in the Estuary (occupying ~5% of the Gulf). We divided the Gulf of St. Lawrence, from the St. Lawrence Estuary to the Cabot Strait to the Strait of Belle Isles into 12 sub-areas based primarily on the distribution and availability of nutrient observations. For each area, we calculated the monthly means, standard deviations and extreme values of nitrate, silicate and phosphate, for 4 depth intervals. As well, a seasonal cycle was fit to the layer data. Results are presented as contour and timeseries plots and provided in tabular form. We used optimal estimation to calculate climatological nitrate, silicate and phosphate distributions at 0, 30, 50, 100, 150m and bottom depths for the 15th of February, May, August and November corresponding to the winter, spring, summer and fall.

Résumé

Brickman, D. and B. Petrie. 2003. Nitrate, silicate and phosphate atlas for the Gulf of St. Lawrence. Can. Tech. Rep. Hydrogr. Ocean Sci. 231, xi + 152 pp.

Nous avons analysé plus de 36 000 observations de nitrates, silicates, et phosphates pour créer un atlas des sels nutritifs dans le golfe du Saint- Laurent. Les statistiques sont fortement influencées par la distribution spatio- temporelle des données : 65% des observations ont lieu en été et en automne, 50% dans les 30m supérieurs et 18% dans l'estuaire (occupant ~5% du golfe). Nous avons divisé le golfe du Saint-Laurent, depuis l'estuaire du fleuve jusqu'au détroit de Cabot et au détroit de Belle-Isle, en 12 sous-zones, en nous fondant surtout sur la distribution et la disponibilité des observations de sels nutritifs. Pour chaque zone, nous avons calculé les moyennes mensuelles, les écarts-types et les valeurs extrêmes des nitrates, silicates et phosphates à 4 intervalles de profondeur. De plus, un cycle saisonnier a été appliqué aux données par couche. Les résultats sont présentés sous forme de tracés de contour et de séries chronologiques ainsi que de tableaux. Nous nous sommes fondés sur les estimations optimales pour calculer les distributions climatologiques de nitrates, silicates et phosphates à des profondeurs de 0, 30, 50, 100, et 150m ainsi qu'au fond les 15 février, mai, août et novembre, ce qui correspond à l'hiver, au printemps, à l'été et à l'automne, respectivement.

1 Introduction

In this report we review the spatial and temporal distributions of nitrate, silicate, and phosphate observations for the Gulf of St. Lawrence (GSL, figure 1). Optimally estimated seasonal concentrations are calculated on a 0.2°x0.2° longitude-latitude grid for 6 vertical levels. The region is broken into 12 subregions (polygons) (figure 2) and monthly statistics (mean, standard deviation, range) are computed for 4 depth ranges. Seasonal cycles, characterized by a mean, amplitude, and phase of the annual harmonic, are fit to the polygon layer data. The polygon data are included in tabular form.

Quality control of the data was accomplished using a combination of methods including visual analysis of plots, editing of raw data files to eliminate bad records, and histogram analysis to identify outliers in value, position, and time. Due to vagaries in data documentation it is often impossible to tell whether nitrate (NO_3^-) values include nitrite (NO_2^{--}) as well. In this report we will refer to all nitrogen species as nitrate, with the proviso that this includes possible nitrite as well. Based on the above, nitrate (N) values greater than 30μM ($\sim$ 1% of the data), silicate (S) values greater than 50μM (<1%), and phosphate (P) values greater than 3.0μM ($\sim$ 0.5%) were considered outliers and eliminated from the analysis. An exception to the above was made for the year 2000 N data which had numerous anomalous May values ($N > 20.0\mu$M for depths less than 30m and longitudes (roughly) between -63 and -59). Although these observations were considered real, they biased the optimally estimated fields and thus were eliminated from the analysis. An earlier review of the nutrient distribution in the Gulf was done by Yeats (1988).

To simplify printing, this report was produced in black and white, resulting in loss of detail in some figures. A colour version of this report is available at:

www.mar.dfo-mpo.gc.ca/science/ocean/coastal_hydrodynamics/bibliography.html

2 Data Distribution

Data were obtained from the chemical database developed at Bedford Institute of Oceanography (BIO) by Peter Strain, from the Marine Environmental Data Service in Ottawa, from the Atlantic Zone Monitoring Program (AZMP) and from l'Institut Maurice-Lamontagne (courtesy of Laure Devine and Claude Savenkoff). These data were supplemented by additions from the new national biological-chemical database, BIOCHEM.

The data span the years 1960–2002, representing 6908 stations and about 37000 samples for each nutrient. The number of observations varies by less than 1.5% among the 3 nutrients, so it suffices to consider the N data as representative of the spatial and temporal distribution. (Although note that there are no N data prior to 1966.)

Spatially, about 32% of the observations occur in the top 10m, with 53% in the upper 30m. The St. Lawrence estuary contains ~18% of the observations, while occupying about 5% of the area. There is a strong seasonal variation in station

distribution, with winter (months 1, 2, 3) having about 6% of the stations, summer 33%, fall 39%, and spring 22% (figure 3). As well, the distribution amongst years is not uniform.

This number of stations may seem adequate for most analyses but the spatial distribution (figures 4 – 7) shows significant regions without data, so that the areal coverage is effectively poor. This effect is magnified when looking at the monthly data distribution. Figure 8 shows the areal fraction of the GSL covered by at least "M" months of data. To create this plot the Gulf was divided into 1° x 1° squares: a square was considered to have data for a particular month if it contained at least 1 observation. We see that all squares (fraction =1) had data for at least 1 month but only 0.45 had data in at least 10 months. Less than 12% has 12 months of coverage. For this reason we concluded it was not realistic to compute monthly data statistics using data interpolated onto a regular grid. Instead, the region was divided into polygons (as in Petrie et al. (1996), Savenkoff et al. (2001), also Petrie et al. (1999) for the Scotian Shelf), the data were binned within each polygon, and analyses done on the polygonal data.

3 Optimally Estimated Seasonal Nutrient Distributions

Despite the unsuitability of the data for computing gridded *monthly* statistics, optimally interpolated nutrient fields should be realistic when estimating over longer (i.e. seasonal) periods and in areas where data coverage is good (e.g. in the near surface depths in the southern Gulf and Estuary).

Optimal estimation (OE) is a technique to determine values of a chosen variable on a fixed grid at a specified time. The method uses data scattered in space and time and a weighting function to interpolate and extrapolate onto the fixed grid. The weighting depends on a four dimensional (x, y, z and t) correlation function specified by the user and the position of the observations in the four dimensional space relative to the fixed grid. We chose the form of the correlation function used by Petrie et al. (1996) for the temperature, salinity and density fields:

$$r = e^{-d}(1 + d + d^2/3)$$

where r is the correlation coefficient and d is a pseudo-distance given by:

$$d = \sqrt{x'^2 + y'^2 + z'^2 + t'^2}$$

The primed quantities represent the scaled variables, e.g., x' is the distance in the x direction divided by the scale in that direction. The x, y, z and t variables represent the horizontal (positive eastwards, northwards), vertical, and time coordinates. The (x, y, z, t) scales were (100 km, 100 km, 30m, 45d). The x, y scales are of the same order as the mean spacing between stations, and this choice was necessary in order to produce a reasonably smooth climatology. The current implementation of OE at BIO, called OAX, allows for selection, at each grid point, of asymmetric horizontal

spatial scales plus rotation of the xy axes in search space. Thus, e.g., the horizontal scale along bathymetric contours can be made larger than the scale across contours. These features were not used for this report. The routine requires, for each grid point, an estimate E = (measurement error variance) / (signal variance). For simplicity, and as this parameter was not readily available, a constant value of 0.1 was input for E. The output of OAX includes a relative estimation error (REE –the uncertainty in an estimate is REE*estimated standard deviation of the signal.). Both the estimate itself and the estimation error depend on E. Qualitatively, there was little sensitivity to changes in E. Additional details of the technique are given by Petrie and Dean-Moore (1996).

The results of optimal estimation and its error estimate depend strongly on the distribution of data in space and time. Given the distribution shown in figures 4–7, we expect that there will be more uncertainty for periods with fewer data, e.g. winter, than for periods with more observations, e.g. summer. Our grid has a 0.2°x0.2° resolution in latitude and longitude, levels at 0, 30, 50, 100, 150 m, where the depth permitted, and the bottom depth. Estimates were made for the 15th of February, May, August and November, the midpoints of the seasons. The region covered by the OE grid, the bottom depths colour coded and the 50, 100, 150, 200 and 250m contours are shown in figure 1.

We chose a relative estimation error of 0.3 as the criterion for excluding the OAX estimated nutrient grid value from a plot. This choice yields a reasonable coincidence between plotted regions and data density. Thus blank areas correspond to regions with low data density or where local depths are less than standard grid depths.

In general it is expected that vertical nutrient profiles show increasing concentration with depth and a seasonal cycle, affecting mostly the top 50-100m, with minima in the summer months due to depletion by biota. This effect is evident in the optimally estimated fields shown in figures 9 - 14 (nitrate), 15 - 20 (silicate), 21 - 26 (phosphate). The seasonal cycle is less evident in the phosphate data. The bottom depth plots essentially mimic bathymetry with higher values in deeper water and vice versa.

Figures 9-26 reveal the characteristic horizontal distribution of nutrients in the GSL, with highest concentrations in the St. Lawrence estuary and lowest ones in the east and southeast areas. The spreading of the high estuary values by the Gaspé Current is evident in many figures (see for example figures 9, 10, 15, 16). This spreading is seen in all seasons and for depths sufficiently above the bottom, but is typically clearest for spring and fall.

One of the notable features in the surface layer nitrate seasonal plots is the high concentrations in the Estuary throughout the year (figure 9, and note the change of scale in summer). This is probably caused by the enhanced vertical mixing in this area forced in part by internal tide generation at the sill outside the Saguenay Fjord and by estuarine driven upwelling (e.g., Koutitonsky and Bugden, 1991, Saucier and Chassé, 2000). Over most of the Gulf, nitrate depletion occurs between winter and spring. In the Estuary, however, the major decrease takes place between spring and summer. Zakardjian et al. (2000) indicate that this could be related to the time scales associated with advection, mixing, phytoplankton sinking and production.

In particular, the strong horizontal advection during the spring runoff could advect developing blooms from the region before they become fully realized.

The 30m seasonal cycle has similar characteristics to the 0m level (figure 10). At 50m, the seasonal cycle is most evident in the Estuary. In winter, there is an eddy-like area of high nutrients in the northwest Gulf, the region of the Anticosti Gyre (figure 11). The high nutrient concentrations are defined by data that were collected in 1973, 1984, 1999 (figure 4). This feature is consistent with the wintertime optimally estimated temperature and salinity fields in Petrie et al. (1996) and the vertical upwelling derived by Bugden (1981). Bugden finds that this area has the strongest upwelling of the entire Gulf. It is also consistent with the circulation derived from the diagnostic solutions of Han et al. (1999) who show an upward bowing of the deeper isopycnals (26, 26.5, and 27 sigma-t contours, their figure 6) and a weak cyclonic circulation in winter (their figure 12). In general, nutrient concentrations tend to be higher in the western half of the Gulf than in the eastern area.

Near surface silicate concentrations remain at a relatively high level in the Estuary throughout the year (figure 15). The Gaspé Current carries these nutrient rich waters into the northwestern Magdalen Shallows where they are transported across the region towards the southeast. This is especially evident in the spring and fall at 0 and 30m (figures 15, 16). From 0-50m, silicate levels are higher in the southwest sector of the Gulf compared to the northeast section (figures 15-17). At the 100 and 150m levels, concentrations increase from Cabot Strait along the Laurentian Channel, reaching maximum values in the Estuary (figures 18, 19). This was noted by Yeats (1988) who found an along channel increase of about 20μM for waters with salinities > 34.

In contrast to the rapid depletions of nitrate and silicate, surface phosphate shows a gradual decrease from winter to minimum values in the summer (figure 21). The winter 50m maximum that was seen in the nitrate distribution north of the Gaspé Peninsula is also evident for phosphate at 50 and 100m (figures 23, 24). At 100 and 150m, this feature persists throughout the year (figures 24, 25).

4 Polygon Based Analyses

As discussed above, the station coverage (figures 3-8) was not sufficient to allow computation of long term statistics at fine horizontal scales. Therefore the Gulf was divided into 12 polygons in order to perform such calculations (figure 2). The choice of polygons was based on previous investigators work (Savenkoff et al. (2001)) plus qualitative analysis of figures 9-26. Polygons 2, 3, and 5 are meant to represent the 3 fixed AZMP stations (Gaspé Current, Anticosti Gyre, and Shediac respectively – marked as bullets on figure 2). Notable is the division of the lower Gulf into Magdalen shoals and Northumberland Strait polygons (6 and 7), and Cabot Strait into west and east sections (polygons 9 and 10). The polygons are numbered so that they (roughly) follow a counterclockwise sequence around the Gulf, starting with the lower estuary (polygon 1). A table is provided to help associate polygon numbers with their assigned names (see table 1).

Nutrient seasonal cycles for the 12 polygons are shown in figures 27-98. For each

polygon a month-depth contour plot is presented first, followed by a plot of the monthly mean, standard deviation, and range of values for depth intervals 0-10m, 10-30m, 30-100m, and 100m-btm. The latter data are included in tables 2-73 (NB: all nutrient values in μM). The month-depth contour plots were created by sorting the polygon data by month and averaging in 10m bins for the top 100m, and 20m bins below 100m. Bins that contain data are marked with dots on the contour plots. With respect to the layer average plots, note that the average depth for polygon 5 is 56m (s.d.=27, max=120), and the average depth for polygon 6 is 56m (s.d=20, max=205) so that, for these polygons, the bottom layer is best represented by the 30-100m layer. The average depth for polygon 7 is 23m (s.d=13, max=58) so that the 10-30m layer best represents the bottom layer. Depth statistics for each polygon are contained in table 1.

The contour and layer plots illustrate the nutrient seasonal cycle. This cycle is characterized by minima in late summer and is strongest in the upper water column. For all polygons the summer surface nitrate minimum is less than 1.0μM, except the estuary (polygon 1) where it is about 3μM (figures 27 and 28). For silicate, the summer surface minimum is less than 2.0μM, except for polygon 1 where it is about 4.5μM, and for phosphate the surface minimum is less than 0.4μM everywhere.

In terms of vertical stratification (top 2 layers versus bottom layer), maximum stratification occurs during the summer. Defining a stratification factor as the ratio of lower layer concentration to upper layer concentration, this parameter is typically (at the summer maximum) at least 5 for nitrate and silicate, but generally about 3–5 for phosphate. During winter the bottom:top concentration ratio typically falls to less than a factor of 2 for nitrate and silicate, the exceptions being polygons 8, 9, 10 which are deeper and thus more stratified, and shallow polygons 5 and 6, which are more affected by wintertime convection and hence are less stratified. For phosphate the winter stratification ratio is about 2 for all polygons. Polygon 7 has no deep winter nutrient data so no comparison is possible.

Note that although the circulation is considered to be different in the eastern and western Cabot Strait, the nutrient fields are very similar (figures 43, 45, 44, 46, 67, 69, 68, 70, 91, 93, 92, 94).

A least-squares technique was used to fit a seasonal cycle to the *raw* layer data (e.g. $N(t) = \bar{A} + A\cos(F(t-\phi))$, $\bar{A}$=mean, A= amplitude, $F = 2\pi/12$, t= fractional month, ϕ=phase, in months). The mean and amplitude as a function of polygon-# are presented in figures 99-101 (the data are contained in tables 74-79 – including r^2, where $r^2 = 1 - \sum (\text{data-fit})^2 / \sum (\text{data-mean})^2$). The figures show that the mean and amplitude of the seasonal cycle decrease as one proceeds counterclockwise around the Gulf from polygon 1, reach a minimum in polygons 6-8 (lower Gulf and Laurentian Channel), and increase slightly as one proceeds through Cabot St. around to the northeast and north (polygons 9-12). This effect is clearest in the top two layers, especially for nitrate and silicate. The r^2's are typically less than 0.5, reflecting the high inherent scatter in the data, and decrease from top to bottom in the water column. Because our goal was to characterize the seasonal cycle for purposes of comparing between polygons, no attempt was made to estimate confidence intervals for the fit parameters or pursue other error analyses. (We emphasize that the fits

were done using the raw layer data, so the results do not necessarily coincide with expectations based on fitting to the mean layer data shown in figures 28,30,...,98.)

Following the "polygon cycle", we find that annual mean surface layer values for **nitrate** start at 8 (μM) in polygon 1, decrease to about 1.0 in polygons 6-8, and increase above 2.0 in polygons 9-12 (polygon cycle = [8,1,2]). The amplitudes start at about 4.0, drop to about 1.0, and then increase above 2.0. For the 10-30m layer the polygon cycle = [9, 1, 2] for the mean, while the amplitude cycle is roughly [2, 1, 2]. For **silicate** the 0-10m annual mean polygon cycle is [12, 3, 4], and the amplitude cycle = [6, 1, 1]. For the 10-30m layer the mean polygon cycle = [13, 3, 3] and the amplitude cycle is [5, 1, 2]. For **phosphate** the polygon cycle is less clear, but for the surface layer is roughly [0.8, 0.5, 0.5] for the annual mean, and [0.4, 0.1, 0.2] for amplitude. For the 10-30m layer the annual mean cycle = [1.0, 0.5, 0.5], and the polygon amplitude cycle is flat at about 0.2.

The weakening of the seasonal cycle in lower layers combined with data variability makes interpretation based on this fitting procedure less certain for these layers. The data tables confirm the summer nutrient minima for the upper layers (phases $\sim$ 1-3 months), with greater variability for the bottom two layers. (N.B. phases $\sim$ 1-3 months imply minima at months 7-10.)

4.1 Variability

The variability in monthly nutrient concentrations can be deduced from figures 27 - 98 and from tables 2-73.

Figures 102-104 show the month of maximum coefficient of variation (CV = s.d./mean) and the annual average and maximum CV's for the 0-10m and 10-30m layers (based on the abovementioned tables).

To summarize, typically, the CV is highest during the summer months, mostly due to lower nutrient values and a roughly constant standard deviation. This holds for all nutrients. Spatially, no obvious pattern emerges although there is a slight tendency for polygons 6-8 to exhibit higher maximum and annual average CV's. This is likely related to the fact that they have the lowest concentrations in the Gulf.

Note that the polygons meant to represent the three AZMP monitoring stations (polygons 2, 3, and 5) do not stand out in any particular way, from each other or the other regions of the Gulf.

5 Summary

Nutrient data from the Gulf of St. Lawrence for the period 1960-2002 were collected and analyzed. Optimally estimated nutrient fields were produced for the 4 seasons at 6 vertical levels. For statistical analysis, the region was broken up into 12 polygon subregions, proceeding counterclockwise around the Gulf from the estuary, south and east to Cabot St., and east and north to the St. of Belle Isle and the north shore of the Gulf. Monthly means, standard deviations and ranges were computed for each

polygon and for 4 depth intervals. A seasonal cycle was fit to the raw data in each depth range.

In general, nutrient concentrations are highest in the estuary, reach a minimum toward Cabot St., and then increase slightly to the east and north. This is true for both the means and amplitudes of the seasonal cycle, and is most obvious in the upper layers, and for nitrate and silicate. The data support the idea that the Gaspé Current transports nutrient rich water from the Estuary into the southwest Gulf.

The data set used contains over 36000 observations for each of nitrate, silicate, and phosphate, representing over 6900 stations, yet does not provide adequate coverage to describe nutrient cycles and variability over the complete Gulf. By comparison, the TS database for the region contains over 60000 stations, from which an acceptable 3D climatology can be derived. As more nutrient data become available, from for example the AZMP and Research Vessel monitoring programs, our understanding of the nutrient climatology of the Gulf of St. Lawrence will become more refined. As a result, we envisage posting revised products appearing in this technical report on the OSD website, to allow faster dissemination of the data than conventional technical reports would allow.

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Table 1: Polygon definitions and depth statistics

polygon #	name	depth:	ave	s.d.	max	min
1	lower estuary		179.6	124.5	381.0	8.0
2	Gaspe		238.1	100.8	421.0	34.0
3	Anticosti west		241.5	87.1	400.0	42.0
4	Anticosti south		270.4	124.9	436.0	17.0
5	Shediac		56.4	27.0	120.0	6.0
6	Magdalen shallows		55.7	19.7	205.0	7.0
7	Northumberland St.		23.1	13.3	58.0	3.0
8	Lawrentian channel		296.8	145.8	478.0	57.0
9	Cabot St. west		280.7	167.1	523.0	24.0
10	Cabot St. east		252.5	171.4	524.0	19.0
11	Esquimau		185.6	117.6	493.0	11.0
12	Anticosti north		155.1	74.9	287.0	7.0

Table 2: Layer Statistics (Polygon 1, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	8.18	6.02	16.34	0.00	11	12.19	0.70	13.17	11.56	3
2	12.99	2.41	18.38	7.57	136	11.84	2.73	16.52	6.05	67
3	12.99	2.55	17.24	4.99	199	11.96	2.80	16.83	5.42	89
4	13.80	3.66	18.37	0.00	60	11.32	3.55	17.76	0.00	63
5	12.49	5.21	24.01	0.06	218	11.78	3.45	21.62	0.10	201
6	7.83	4.20	19.86	0.01	500	9.74	3.46	20.28	0.02	308
7	4.17	4.23	20.00	0.00	475	8.08	3.76	20.00	0.00	295
8	3.08	3.22	17.48	0.02	363	6.78	3.57	18.82	0.06	265
9	7.94	5.10	27.55	0.08	177	11.45	4.64	26.65	0.58	108
10	7.30	2.69	13.78	1.09	172	7.59	2.76	13.82	1.21	84
11	10.54	3.32	16.33	1.90	147	10.76	3.31	17.24	3.25	102
12	11.02	3.44	26.37	3.45	222	10.41	3.70	21.83	3.48	130

Table 3: Layer Statistics (Polygon 1, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	13.42	1.51	16.92	11.67	9	22.85	2.80	25.58	16.63	21
2	10.58	1.83	14.19	5.12	55	16.59	3.05	24.09	11.63	53
3	10.26	2.52	16.55	5.37	67	15.10	4.36	25.66	7.25	66
4	9.23	2.68	14.47	4.43	33	15.76	5.76	24.09	0.00	31
5	10.37	3.79	17.93	0.00	96	16.99	5.28	27.98	3.97	147
6	8.68	3.16	17.32	0.85	152	16.22	5.30	24.87	2.27	175
7	9.90	3.19	17.73	2.75	216	15.92	4.94	25.11	0.00	188
8	9.01	3.31	19.16	0.33	162	16.16	5.30	29.26	2.61	138
9	12.27	4.43	22.40	1.10	75	19.12	4.61	28.01	7.70	85
10	8.75	2.66	16.52	3.94	65	13.23	4.50	22.45	5.24	61
11	10.20	3.12	17.76	2.31	57	19.36	5.68	26.16	4.47	138
12	11.14	3.99	25.26	3.76	94	20.26	4.70	29.18	5.22	211

Table 4: Layer Statistics (Polygon 2, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	10.27	5.80	16.61	0.00	16	12.91	3.34	16.59	5.17	8
2	8.52	2.81	15.30	3.91	50	8.02	2.48	13.78	4.68	35
3	12.61	1.68	17.55	8.29	76	12.51	2.08	17.80	8.08	36
4	10.99	3.75	17.64	2.30	22	8.92	3.56	18.01	2.17	22
5	7.82	4.70	16.73	0.00	69	6.29	4.64	16.84	0.00	97
6	2.21	2.87	11.25	0.00	254	3.33	3.14	13.01	0.00	261
7	0.36	0.76	6.91	0.00	91	6.05	4.29	13.75	0.11	41
8	1.01	1.98	20.68	0.02	172	3.04	2.97	10.66	0.02	148
9	0.75	1.22	5.29	0.00	59	3.51	3.61	11.04	0.04	27
10	6.40	5.42	21.05	0.47	111	5.33	3.57	14.15	0.23	67
11	8.03	3.06	14.11	0.11	126	6.89	3.21	14.01	0.08	117
12	6.53	3.09	18.52	2.81	108	6.55	3.33	17.89	2.58	78

Table 5: Layer Statistics (Polygon 2, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	11.11	1.84	14.64	7.12	14	21.08	3.41	25.93	15.17	23
2	8.73	2.37	15.88	5.27	40	18.62	3.71	25.61	11.78	80
3	9.62	1.64	12.47	6.95	19	14.87	3.32	23.97	7.66	49
4	10.06	1.78	14.39	7.69	14	17.84	4.31	24.34	9.85	15
5	6.78	3.40	13.01	0.10	41	16.61	4.87	23.43	6.71	58
6	6.44	3.44	22.10	0.25	147	16.53	5.13	29.30	0.80	212
7	7.50	3.33	16.99	1.90	42	15.55	4.42	23.63	5.94	70
8	8.15	3.30	16.10	0.05	90	18.83	5.48	29.92	5.17	151
9	7.51	2.69	12.55	1.63	22	16.65	6.59	27.64	0.52	64
10	7.44	2.73	14.72	1.83	37	14.39	4.04	24.46	5.81	97
11	9.86	3.67	18.43	0.08	130	20.58	5.05	26.67	0.12	305
12	8.61	3.26	16.50	2.76	77	19.24	5.24	26.01	3.70	195

Table 6: Layer Statistics (Polygon 3, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.44	3.05	11.41	0.00	18	9.86	1.31	12.16	8.28	8
2	8.82	1.81	12.58	5.90	15	8.94	2.48	12.96	4.78	10
3	9.84	1.88	12.67	5.50	25	9.70	1.69	12.64	7.79	11
4	5.33	3.96	10.89	0.26	44	5.50	3.68	16.51	0.03	58
5	2.61	4.43	14.73	0.00	94	3.66	3.81	14.83	0.02	133
6	1.40	2.09	10.31	0.00	151	3.55	3.35	16.22	0.00	179
7	0.74	1.87	12.03	0.04	76	3.42	2.49	9.29	0.05	80
8	0.56	0.64	3.03	0.00	149	3.24	2.54	9.94	0.03	151
9	2.33	3.84	19.27	0.01	52	4.53	4.50	17.93	0.14	47
10	1.72	1.49	4.73	0.06	24	4.51	3.07	11.62	0.09	22
11	4.69	2.35	11.78	0.01	86	5.07	2.16	11.44	0.44	101
12	5.70	2.27	12.08	1.07	111	6.65	2.46	14.46	1.12	90

Table 7: Layer Statistics (Polygon 3, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	13.11	3.17	17.23	8.00	18	21.71	2.88	26.15	16.56	25
2	9.87	3.07	18.95	6.84	14	19.83	3.89	24.47	10.30	26
3	11.56	4.35	17.99	5.72	8	18.41	5.54	25.04	9.18	20
4	10.56	4.44	19.39	0.00	35	19.54	4.61	24.64	7.27	44
5	8.02	4.42	19.32	0.13	56	18.42	5.42	24.83	4.66	86
6	8.78	4.43	21.02	0.64	108	17.90	5.64	29.79	5.09	161
7	9.20	3.16	15.98	1.74	58	17.13	4.68	24.13	6.47	67
8	8.93	3.50	17.07	0.05	90	18.31	5.02	29.41	6.65	127
9	8.57	4.89	17.09	0.21	35	19.05	5.43	26.56	6.25	62
10	9.68	3.83	15.85	4.14	12	17.67	5.05	28.48	4.37	35
11	11.14	3.29	19.55	1.12	126	21.10	4.33	27.99	6.86	326
12	11.06	4.40	20.72	0.94	112	21.18	4.59	29.86	7.22	247

Table 8: Layer Statistics (Polygon 4, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.22	0.73	7.76	5.20	11	5.78	0.38	6.42	5.45	4
2	8.15	1.98	11.75	6.20	8	8.09	1.53	10.53	6.14	7
3	8.56	2.89	14.53	3.50	9	7.22	0.00	7.22	7.22	1
4	4.95	2.52	7.85	0.06	11	4.72	2.72	8.20	0.23	19
5	1.49	2.55	12.00	0.02	26	2.80	3.12	12.91	0.05	36
6	0.56	1.39	9.43	0.00	76	1.07	1.52	7.02	0.00	112
7	0.28	0.19	0.87	0.03	29	0.80	0.97	4.13	0.02	38
8	0.38	0.47	2.57	0.00	85	0.98	1.67	7.82	0.00	56
9	0.69	0.66	2.98	0.04	73	1.51	1.52	7.12	0.03	23
10					0					0
11	2.60	1.78	8.09	0.28	111	2.56	1.60	8.68	0.24	109
12	3.99	3.51	27.71	1.39	58	3.48	2.00	15.03	1.61	68

Table 9: Layer Statistics (Polygon 4, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	8.92	3.65	16.28	5.48	17	20.15	3.49	24.04	7.70	50
2	8.12	1.77	12.37	6.02	11	19.41	4.32	24.24	9.00	30
3	6.95	0.00	6.95	6.95	1	15.95	3.50	19.45	12.45	2
4	5.01	2.71	8.75	0.11	12	14.87	5.80	22.23	3.78	11
5	5.88	3.97	16.85	0.11	18	17.67	5.42	23.33	4.88	34
6	5.81	4.03	17.45	0.12	80	17.34	6.24	28.96	0.48	106
7	5.98	2.68	12.54	1.89	31	14.70	4.44	22.08	6.79	26
8	5.58	2.71	11.06	0.00	49	14.54	5.11	26.18	1.64	46
9	8.96	4.88	26.85	2.33	32	18.64	6.01	27.26	0.51	69
10					0					0
11	7.74	2.95	14.87	1.58	178	19.41	5.13	30.00	7.40	505
12	7.52	3.45	23.30	2.63	94	18.34	5.07	26.35	8.29	247

Table 10: Layer Statistics (Polygon 5, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3	7.67	2.60	12.95	0.46	14					0
4	5.31	1.39	9.56	3.08	40	9.66	3.87	14.34	1.15	20
5	0.98	1.99	7.49	0.05	31	1.80	2.23	8.34	0.04	42
6	0.51	1.18	5.71	0.00	119	2.03	1.80	7.02	0.00	135
7	0.11	0.13	0.88	0.00	83	1.03	1.14	4.53	0.00	89
8	0.18	0.13	0.63	0.00	61	1.80	2.37	11.98	0.00	66
9	0.49	0.71	4.81	0.00	141	2.49	2.43	7.21	0.03	46
10	1.24	1.26	5.02	0.09	23	1.73	1.84	8.89	0.10	19
11	4.02	1.55	7.38	1.42	30	4.38	2.01	12.08	1.79	29
12	5.29	1.56	8.52	2.44	27	4.97	1.51	8.69	2.36	26

Table 11: Layer Statistics (Polygon 5, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3					0					0
4	10.16	3.44	15.94	4.61	25					0
5	8.19	2.70	12.32	1.06	48					0
6	7.90	3.09	14.56	0.07	89	12.88	0.00	12.88	12.88	1
7	7.00	3.72	14.00	0.73	43					0
8	9.00	2.98	15.78	0.93	57	16.24	1.65	18.27	14.23	3
9	9.79	3.43	15.64	0.11	144	11.38	1.77	14.21	7.87	7
10	7.60	4.27	15.61	1.04	43					0
11	7.90	3.89	16.12	2.32	43					0
12	6.87	2.50	12.34	3.23	28					0

Table 12: Layer Statistics (Polygon 6, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.63	0.00	6.63	6.63	1	6.63	0.00	6.63	6.63	1
2	6.86	0.23	7.18	6.64	3	7.28	0.00	7.28	7.28	1
3	7.02	1.93	11.07	3.44	35					0
4	7.63	0.60	8.48	7.01	8	7.44	0.86	8.58	5.90	7
5	1.15	2.64	12.38	0.00	54	1.30	2.70	12.54	0.00	70
6	0.26	0.45	4.00	0.00	208	1.05	1.44	9.71	0.00	296
7	2.19	6.60	25.42	0.00	26	0.59	0.89	3.96	0.00	31
8	0.25	0.15	0.77	0.02	90	0.98	1.27	6.65	0.01	92
9	0.40	0.76	10.39	0.00	342	2.26	3.28	17.88	0.12	55
10	1.10	0.49	1.89	0.01	14	1.90	1.25	5.39	0.90	10
11	2.98	1.48	8.14	0.09	72	3.15	1.41	7.29	0.26	76
12	3.62	1.43	7.11	1.52	60	3.64	1.31	7.01	1.64	70

Table 13: Layer Statistics (Polygon 6, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.66	0.00	6.66	6.66	1					0
2	7.18	0.24	7.56	6.83	6					0
3					0					0
4	7.93	0.84	9.01	6.89	6	16.45	2.88	19.34	13.57	2
5	5.64	3.06	12.68	0.20	40					0
6	5.51	2.89	13.08	0.00	140	10.73	0.85	11.59	9.88	4
7	5.10	2.62	11.30	1.46	17					0
8	5.73	3.21	14.64	0.02	35					0
9	7.99	3.08	17.28	0.04	382	10.91	5.80	16.80	0.40	6
10	8.69	2.14	11.12	5.71	5					0
11	8.74	3.65	17.05	1.41	70					0
12	9.38	3.63	15.67	2.71	57					0

Table 14: Layer Statistics (Polygon 7, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2	4.43	0.00	4.43	4.43	1					0
3	1.77	1.61	5.11	0.21	11					0
4	2.01	0.00	2.01	2.01	1					0
5	0.67	1.14	3.16	0.01	6					0
6	0.12	0.11	0.48	0.01	52	0.44	0.57	2.49	0.01	38
7	0.18	0.23	1.64	0.01	112	0.39	0.50	2.73	0.01	80
8	0.10	0.06	0.31	0.01	80	0.62	0.76	3.32	0.01	95
9	0.45	1.61	15.64	0.00	188	0.82	1.42	8.57	0.00	83
10	0.31	0.36	2.13	0.03	138	0.35	0.31	1.63	0.07	38
11	1.06	1.01	4.41	0.03	202	1.60	0.73	3.51	0.32	47
12	4.81	3.55	24.49	1.77	43	2.30	0.00	2.30	2.30	1

Table 15: Layer Statistics (Polygon 7, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3					0					0
4					0					0
5					0					0
6					0					0
7	3.80	1.01	5.28	2.34	5					0
8	2.07	0.00	2.07	2.07	1					0
9	5.32	4.59	18.16	0.00	68					0
10					0					0
11	2.39	0.88	3.83	1.14	20					0
12	2.47	0.17	2.78	2.20	9					0

Table 16: Layer Statistics (Polygon 8, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.17	0.01	0.17	0.16	2	0.39	0.28	0.86	0.16	4
2					0					0
3	3.34	0.91	4.77	1.71	30	3.45	0.81	4.97	2.28	30
4	1.07	1.68	6.13	0.05	21	1.59	1.88	5.60	0.03	23
5	0.38	0.44	1.66	0.02	11	0.72	0.97	3.28	0.07	9
6	0.13	0.10	0.27	0.02	5	1.21	3.18	10.18	0.01	9
7	0.34	0.85	6.00	0.01	61	0.29	0.56	4.80	0.03	112
8	1.01	0.78	1.96	0.03	10	1.04	1.21	3.76	0.03	9
9	0.11	0.08	0.22	0.02	7	0.52	1.01	3.98	0.01	14
10	0.34	0.52	3.81	0.06	83	0.68	1.08	5.46	0.06	77
11	1.06	0.80	3.90	0.02	28	1.25	0.75	2.73	0.27	13
12	1.72	1.31	4.01	0.59	10	0.77	0.14	0.91	0.62	2

Table 17: Layer Statistics (Polygon 8, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	1.83	2.50	6.25	0.01	6	5.54	5.86	13.90	0.04	4
2					0					0
3	4.34	1.00	6.10	2.74	6	11.17	4.81	19.98	4.22	17
4	2.42	2.36	9.08	0.03	36	8.18	8.16	23.21	0.03	16
5	3.13	2.36	6.57	0.14	15	15.73	6.80	23.10	0.01	14
6	2.59	2.65	8.12	0.01	15	14.77	7.38	23.03	0.04	22
7	2.23	2.79	14.75	0.01	198	9.55	8.32	22.61	0.05	135
8	3.12	2.50	8.26	0.01	23	15.09	6.87	24.32	0.01	39
9	2.81	2.76	7.50	0.04	18	16.24	7.17	23.65	0.04	47
10	3.38	3.76	11.70	0.06	211					0
11	5.94	2.68	12.78	0.48	74	16.07	4.86	23.02	5.09	176
12	4.00	2.19	9.21	1.21	13	15.91	4.98	22.18	5.12	67

Table 18: Layer Statistics (Polygon 9, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.90	1.36	8.32	3.88	10	7.27	0.93	8.27	6.03	3
2	5.47	0.00	5.47	5.47	1	7.25	1.32	9.62	5.68	12
3	6.65	0.77	7.63	4.99	19	7.14	0.27	7.65	6.80	16
4	1.21	2.28	6.49	0.01	15	1.05	2.08	6.55	0.00	26
5	0.33	0.33	1.50	0.00	31	0.68	0.83	3.81	0.00	52
6	0.27	0.27	1.32	0.01	115	0.52	0.67	3.57	0.00	161
7	0.23	0.20	1.07	0.00	31	0.27	0.27	1.20	0.01	37
8	0.47	0.86	3.57	0.04	16	0.83	0.94	3.36	0.08	21
9	0.47	0.35	1.44	0.05	74	0.95	1.33	4.60	0.00	30
10	1.07	0.63	2.46	0.24	33	1.71	1.86	9.19	0.38	67
11	1.76	1.11	5.22	0.08	116	2.01	1.32	7.31	0.29	113
12	3.30	3.30	19.33	0.79	55	2.70	1.12	4.75	0.84	45

Table 19: Layer Statistics (Polygon 9, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.54	1.50	8.72	3.63	19	17.00	5.41	22.90	6.46	44
2	7.46	1.76	10.21	5.37	21	18.75	5.59	24.28	6.30	54
3	7.00	0.20	7.35	6.87	4					0
4	4.54	3.67	20.30	0.05	30	15.20	5.73	22.54	5.59	36
5	4.14	2.15	10.75	0.42	62	16.15	6.06	23.28	0.84	90
6	4.13	2.89	13.35	0.12	125	15.89	6.06	26.31	3.22	206
7	4.03	2.47	9.45	0.22	33	14.21	4.35	21.48	4.12	52
8	4.83	2.32	8.63	0.48	21	15.42	4.83	21.61	6.17	33
9	5.29	3.43	15.92	0.73	22	16.13	5.06	23.41	2.07	104
10	4.78	2.58	10.28	0.63	172	15.38	4.86	21.46	5.63	101
11	5.21	3.05	14.23	0.30	174	17.67	5.71	26.43	3.62	466
12	5.24	2.85	13.37	1.14	69	16.94	5.12	24.03	4.27	228

Table 20: Layer Statistics (Polygon 10, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.76	2.33	10.83	3.95	5	8.59	2.35	10.93	6.24	2
2	2.65	0.43	3.08	2.21	2	3.92	0.72	4.64	3.19	4
3	5.15	1.25	7.16	2.84	7	5.84	1.55	7.09	2.87	6
4	1.73	2.24	5.26	0.00	7	2.16	2.22	5.72	0.00	11
5	2.71	4.86	13.57	0.26	6	0.69	0.39	1.40	0.26	8
6	0.19	0.12	0.42	0.00	30	0.47	0.83	5.12	0.03	48
7	0.20	0.12	0.37	0.08	12	0.54	0.77	2.84	0.07	11
8	1.04	0.68	2.04	0.01	11	0.96	0.74	2.04	0.01	9
9	0.40	0.10	0.49	0.30	2	0.82	0.46	1.56	0.20	5
10	2.77	1.66	5.89	0.92	10	4.99	1.69	6.39	2.00	11
11	1.73	1.24	4.77	0.20	47	2.85	2.66	10.61	0.57	42
12	1.99	1.19	5.66	0.75	25	1.49	0.49	2.98	0.83	33

Table 21: Layer Statistics (Polygon 10, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.47	3.17	12.90	4.06	12	15.04	4.53	21.99	6.31	19
2	5.28	0.98	6.43	3.58	6	13.73	5.78	23.05	6.18	9
3	5.91	0.60	6.51	5.30	2	16.26	5.08	21.67	9.23	5
4	3.33	2.58	7.08	0.05	8	12.46	5.75	19.64	1.46	7
5	3.88	2.42	9.73	0.65	17	16.46	5.67	23.19	4.91	30
6	3.27	1.83	7.61	0.77	39	13.42	6.06	23.18	4.23	88
7	4.24	2.01	8.10	1.65	13	12.45	5.02	20.05	3.41	18
8	4.60	2.24	8.48	0.56	12	15.64	5.43	25.03	6.33	16
9	5.06	1.44	6.89	3.64	4	17.55	5.51	21.65	4.37	18
10	6.68	0.77	7.89	5.10	37	13.33	4.38	19.75	8.38	18
11	5.23	3.73	20.96	0.47	77	15.05	5.51	24.81	3.36	180
12	3.33	1.75	7.00	1.07	33	11.92	5.44	23.52	1.86	96

Table 22: Layer Statistics (Polygon 11, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	5.61	1.27	7.68	2.16	21	4.88	2.07	7.74	2.41	4
2	3.00	0.12	3.12	2.88	2	2.83	0.32	3.15	2.52	2
3	6.18	1.02	8.53	4.29	49	6.46	2.00	8.44	0.38	13
4	2.19	2.34	7.40	0.02	104	2.95	2.50	9.15	0.07	151
5	0.31	0.93	5.81	0.00	74	0.50	1.30	6.09	0.00	85
6	0.24	0.37	3.04	0.00	200	0.41	0.74	5.43	0.00	307
7	0.26	0.30	1.66	0.01	96	0.46	1.07	10.63	0.00	121
8	0.67	0.75	4.92	0.00	119	0.78	1.44	9.11	0.00	80
9	0.81	1.66	9.10	0.02	41	0.59	0.57	2.17	0.00	19
10	2.49	0.89	3.68	1.33	10	3.07	1.62	7.50	1.57	10
11	1.76	0.88	4.58	0.09	169	1.99	1.12	7.82	0.22	200
12	2.61	1.53	16.27	0.66	110	2.37	1.11	11.14	1.16	136

Table 23: Layer Statistics (Polygon 11, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.02	2.20	12.10	4.54	38	18.15	3.80	23.41	9.05	78
2	2.88	0.00	2.88	2.88	1					0
3	6.59	1.03	9.07	5.69	13	11.73	4.19	17.20	5.84	11
4	5.21	3.04	13.65	0.24	185	13.84	6.58	24.15	0.00	101
5	4.74	2.65	12.38	0.04	73	11.20	5.71	22.77	4.20	30
6	4.37	2.88	13.21	0.00	215	14.94	5.64	23.69	2.53	266
7	4.90	2.60	11.41	0.23	97	13.82	5.82	26.45	0.14	60
8	4.72	3.21	11.88	0.00	85	15.02	5.53	26.08	4.90	81
9	6.14	3.20	12.80	1.94	27	16.22	6.48	23.54	3.25	37
10	5.27	3.19	9.32	2.26	5	12.73	7.04	24.34	2.49	8
11	6.30	3.25	23.14	0.46	256	16.70	5.81	27.77	2.41	542
12	5.66	2.65	16.90	1.27	149	15.49	5.45	24.23	3.09	263

Table 24: Layer Statistics (Polygon 12, nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.37	0.23	7.66	7.09	3	7.62	0.00	7.62	7.62	1
2					0					0
3	6.52	1.43	9.95	3.62	27	6.88	0.04	6.92	6.85	2
4	2.17	2.50	7.10	0.00	25	2.39	2.32	7.10	0.00	37
5	2.80	2.67	8.59	0.00	37	3.60	2.67	7.52	0.11	57
6	0.47	0.47	2.10	0.00	42	0.73	0.84	4.84	0.00	61
7	0.61	0.95	3.76	0.00	44	1.35	1.61	5.22	0.02	57
8	0.61	0.79	3.19	0.00	31	2.31	2.46	8.49	0.00	33
9	0.81	1.28	8.68	0.02	42	0.55	0.35	1.26	0.00	27
10	3.25	0.19	3.44	3.06	2	4.23	0.10	4.33	4.13	2
11	2.20	0.96	5.20	0.48	45	2.50	1.07	5.24	0.37	64
12	2.20	0.94	5.62	0.80	44	2.55	1.75	11.81	1.21	57

Table 25: Layer Statistics (Polygon 12, nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.39	0.55	8.22	6.76	7	16.97	5.34	21.77	6.95	7
2					0					0
3	7.22	1.29	10.43	6.30	8	15.39	4.87	22.56	9.55	5
4	4.58	2.71	9.86	0.14	18	15.29	6.18	24.68	6.17	16
5	5.25	2.55	9.16	0.63	29	10.16	4.39	18.24	3.82	10
6	4.59	2.59	11.09	0.31	45	13.83	5.75	28.79	4.83	42
7	5.65	2.75	11.59	0.11	43	14.17	5.00	22.69	5.05	23
8	5.57	2.54	10.50	1.37	36	14.23	5.12	22.06	3.86	48
9	4.72	2.78	9.34	0.66	23	16.08	6.90	26.55	4.60	23
10	7.74	0.00	7.74	7.74	1	11.25	0.00	11.25	11.25	1
11	6.48	2.79	13.46	0.72	84	15.40	5.27	24.25	5.60	80
12	3.41	2.27	9.30	0.93	60	12.99	6.63	28.30	3.23	75

Table 26: Layer Statistics (Polygon 1, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	9.80	7.28	20.58	0.00	13	14.32	1.62	16.61	13.14	3
2	18.73	1.22	19.94	17.51	2	17.14	1.69	19.50	15.59	3
3	20.07	2.66	22.75	14.46	6					0
4	18.72	4.34	22.69	0.00	60	15.56	5.07	22.47	0.00	63
5	14.95	7.55	28.86	0.29	177	15.92	5.33	25.38	0.44	199
6	12.89	5.14	23.13	0.48	117	13.93	4.14	22.76	0.37	168
7	7.23	5.07	21.55	0.00	153	10.01	4.45	17.10	0.11	167
8	4.42	4.02	29.51	0.39	112	5.95	5.16	44.86	0.22	142
9	12.95	5.41	18.46	1.80	40	12.66	6.03	18.07	1.67	38
10					0					0
11	17.36	2.98	29.09	12.22	34	13.61	4.89	24.72	2.82	46
12	18.68	3.63	28.26	11.17	44	17.16	4.32	28.11	7.20	44

Table 27: Layer Statistics (Polygon 1, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	14.31	2.16	19.36	11.78	9	36.59	9.69	49.78	19.97	17
2	13.01	2.35	16.05	10.34	3	34.52	10.51	48.21	20.79	8
3					0					0
4	12.15	4.19	21.09	5.01	33	22.62	11.85	44.63	0.00	28
5	12.85	5.03	23.75	2.47	77	26.06	11.80	45.64	4.70	101
6	11.86	5.08	23.83	2.32	82	28.97	12.39	49.30	6.54	89
7	11.03	5.12	41.06	1.92	145	24.75	13.92	48.60	0.00	82
8	8.12	4.25	21.27	1.59	69	25.39	11.15	49.13	5.48	59
9	13.27	6.04	25.81	2.31	23	35.92	10.88	47.25	8.69	41
10					0					0
11	11.78	5.41	24.22	5.55	25	32.30	11.74	49.16	12.50	47
12	15.23	7.71	46.25	5.25	35	34.35	11.44	49.96	8.72	89

Table 28: Layer Statistics (Polygon 2, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	15.05	8.75	27.41	0.00	15	17.99	4.23	27.54	12.37	8
2	12.52	4.93	19.55	2.40	16	13.67	3.14	17.25	8.34	10
3	15.38	3.74	23.47	9.70	13	20.16	4.20	25.06	14.82	4
4	16.43	6.38	28.66	3.52	22	13.25	5.98	30.77	3.21	22
5	10.47	6.77	25.38	0.25	83	8.77	6.16	23.88	0.28	101
6	6.13	5.26	19.45	0.28	143	5.70	4.75	20.76	0.05	200
7	1.76	1.99	9.43	0.15	21	3.65	2.75	10.98	0.54	24
8	1.88	1.29	6.98	0.12	93	2.39	2.28	12.70	0.28	122
9	1.59	1.76	7.34	0.30	48	3.72	2.72	9.20	0.84	22
10	8.48	4.57	16.36	1.62	14	5.60	3.98	15.63	0.85	16
11	8.84	4.72	19.27	0.09	78	7.29	4.13	17.66	0.36	93
12	9.43	4.65	22.40	3.25	53	8.09	2.87	16.25	3.81	49

Table 29: Layer Statistics (Polygon 2, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	12.22	2.52	16.60	6.92	14	30.02	9.48	47.20	16.41	21
2	12.03	3.82	21.92	8.20	13	31.89	10.16	49.49	11.55	27
3	12.64	1.65	14.29	11.00	2	24.39	8.16	36.67	14.69	4
4	12.60	2.59	16.91	8.58	14	27.24	10.15	43.77	12.27	15
5	8.00	4.43	18.31	0.42	43	25.15	10.06	42.16	8.75	52
6	7.55	5.31	23.13	0.42	114	25.66	11.09	48.31	4.52	130
7	7.65	5.00	22.09	0.70	26	24.64	11.62	47.00	3.58	38
8	7.09	3.57	16.73	0.83	67	25.33	10.47	46.89	4.67	75
9	9.53	8.45	42.85	2.67	18	27.26	10.51	49.89	5.49	55
10	7.38	1.86	10.91	4.32	8	23.26	6.11	37.34	15.48	11
11	9.93	4.50	23.28	1.68	118	33.77	11.15	49.92	9.86	234
12	9.31	4.21	23.87	3.58	61	33.39	11.17	49.66	10.90	141

Table 30: Layer Statistics (Polygon 3, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.94	3.90	13.84	0.00	16	11.56	1.67	14.04	9.11	8
2	9.32	3.09	13.81	3.20	10	11.02	2.56	16.08	8.29	6
3	11.70	1.75	16.42	9.16	13	13.14	2.47	16.32	10.00	4
4	8.76	5.85	21.14	1.31	42	8.34	5.75	24.62	0.81	58
5	4.86	6.57	23.43	0.13	107	4.47	4.83	20.79	0.07	141
6	4.19	4.67	19.29	0.35	125	4.46	4.60	19.65	0.15	165
7	2.09	1.76	8.44	0.13	68	3.35	2.22	10.80	0.04	79
8	1.96	1.18	8.66	0.41	140	3.46	3.59	40.29	0.35	147
9	2.93	2.89	12.55	0.32	53	3.70	2.63	13.47	0.35	45
10	1.53	1.57	4.55	0.34	13	4.48	3.10	10.11	0.32	14
11	4.71	2.70	12.39	0.07	80	5.22	2.45	12.55	0.10	100
12	6.65	2.53	13.32	0.05	87	7.98	2.83	13.64	0.68	74

Table 31: Layer Statistics (Polygon 3, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	14.46	4.53	25.73	8.17	18	33.33	8.90	47.93	20.57	25
2	11.64	4.46	24.43	8.37	10	31.71	8.69	46.05	16.06	18
3	20.70	4.00	23.67	15.05	3	35.99	2.24	38.33	32.20	5
4	13.28	6.30	29.59	0.00	35	31.11	11.35	48.08	10.32	41
5	9.37	6.30	31.16	0.47	59	28.07	11.85	48.40	5.09	84
6	9.36	5.58	23.69	0.52	98	27.26	11.44	49.20	3.80	144
7	9.08	4.35	21.81	1.00	55	27.33	12.22	47.41	7.28	72
8	8.32	3.94	23.70	1.31	85	25.48	11.50	49.48	4.15	115
9	8.19	4.67	17.19	1.47	36	27.45	12.60	48.46	5.20	61
10	12.70	2.45	15.45	9.96	7	35.86	10.70	49.92	15.75	18
11	11.38	4.56	32.28	0.20	126	32.21	11.12	49.93	9.05	304
12	11.76	4.73	22.64	2.11	99	32.87	10.68	49.64	6.73	220

Table 32: Layer Statistics (Polygon 4, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	5.42	0.67	7.01	4.71	11	5.16	0.32	5.55	4.66	4
2	8.07	2.06	12.08	5.94	8	7.82	1.91	11.01	5.85	7
3	9.76	2.86	15.67	7.17	8	7.06	0.00	7.06	7.06	1
4	7.33	3.27	11.22	0.91	11	6.10	3.14	10.56	0.86	19
5	2.37	2.74	14.78	0.22	35	3.54	3.87	14.78	0.22	45
6	2.75	2.82	11.68	0.02	76	3.37	4.18	22.91	0.02	111
7	1.49	1.02	4.56	0.46	29	1.57	1.11	4.83	0.27	38
8	1.51	1.09	6.79	0.24	40	1.92	1.26	7.75	0.32	36
9	1.56	1.17	7.77	0.17	72	2.29	2.84	15.42	0.72	23
10					0					0
11	3.08	1.93	11.97	0.20	111	3.10	1.47	8.71	0.16	101
12	4.24	1.94	9.47	2.14	59	3.93	1.45	7.85	2.42	68

Table 33: Layer Statistics (Polygon 4, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	8.27	3.96	17.07	5.00	17	23.84	6.39	36.89	7.42	50
2	7.36	1.88	11.84	5.00	12	24.71	9.33	42.00	8.26	35
3	7.14	0.00	7.14	7.14	1	17.41	4.32	21.73	13.09	2
4	6.27	3.24	10.33	0.97	12	17.33	8.45	33.81	4.40	11
5	5.80	4.10	17.79	0.21	23	22.50	9.14	34.91	4.56	34
6	7.86	6.53	30.10	0.11	77	24.69	10.73	49.92	2.27	94
7	6.15	3.89	14.81	1.14	36	19.76	9.90	46.24	5.07	28
8	4.17	2.87	11.40	0.67	30	16.68	7.83	30.58	1.42	37
9	9.22	7.30	36.51	2.53	32	27.75	10.88	46.22	1.75	69
10					0					0
11	6.90	2.78	15.66	1.61	177	24.65	9.17	42.98	5.24	487
12	7.39	3.90	28.11	2.11	94	23.42	9.47	39.70	5.81	248

Table 34: Layer Statistics (Polygon 5, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3	9.61	2.76	16.02	2.92	14					0
4	12.62	5.23	19.33	6.34	11	9.68	5.20	21.60	4.41	7
5	2.34	2.93	9.45	0.22	31	2.23	2.66	9.94	0.21	42
6	2.59	2.69	12.78	0.21	125	3.51	2.74	14.37	0.08	135
7	2.08	1.48	10.95	0.00	120	3.38	2.68	11.16	0.06	108
8	2.01	1.08	4.81	0.00	52	3.30	2.98	18.34	0.00	64
9	1.43	1.19	6.64	0.01	175	5.12	4.48	14.46	0.21	50
10	2.63	1.68	8.27	0.30	37	2.87	1.75	9.95	0.51	25
11	4.79	2.01	10.38	2.22	30	5.11	2.22	10.84	2.36	29
12	4.91	2.01	10.46	1.64	27	5.18	2.00	10.60	2.44	26

Table 35: Layer Statistics (Polygon 5, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3					0					0
4	14.08	7.74	34.18	6.18	21					0
5	10.83	4.76	19.58	0.95	48					0
6	11.96	6.19	30.84	0.30	89	14.92	0.00	14.92	14.92	1
7	11.77	6.59	26.31	1.10	52					0
8	12.06	5.48	26.11	1.83	55	14.52	2.75	17.61	10.93	3
9	16.72	5.75	25.98	0.94	180	19.04	3.62	25.05	12.06	9
10	10.17	6.31	24.97	2.78	45					0
11	10.59	6.27	23.29	2.48	44	19.00	0.00	19.00	19.00	1
12	8.83	4.01	19.68	4.65	27					0

Table 36: Layer Statistics (Polygon 6, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.05	0.00	6.05	6.05	1	5.97	0.00	5.97	5.97	1
2	6.49	2.44	8.66	1.28	6	6.88	1.25	8.65	6.00	3
3	8.16	2.01	12.98	5.18	35					0
4	11.97	0.86	13.87	11.04	8	10.28	3.41	13.99	3.00	7
5	2.34	3.73	17.92	0.11	66	1.83	3.02	15.09	0.11	84
6	1.87	1.72	9.47	0.07	189	2.74	3.25	26.43	0.13	261
7	1.42	0.98	4.13	0.44	26	1.31	1.06	5.04	0.12	32
8	2.19	1.54	12.04	0.09	58	2.95	3.52	29.79	0.34	88
9	1.25	0.78	7.12	0.13	383	3.40	3.33	14.81	0.17	68
10	2.45	1.61	4.83	0.28	16	3.34	1.41	6.65	1.96	10
11	4.56	1.82	12.28	0.58	73	4.69	1.79	9.98	0.81	77
12	4.23	1.35	8.87	1.70	56	4.37	1.03	7.12	1.91	67

Table 37: Layer Statistics (Polygon 6, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.09	0.00	6.09	6.09	1					0
2	6.03	2.74	9.74	0.50	14					0
3					0					0
4	11.42	3.35	14.51	6.31	6	20.93	4.43	25.36	16.49	2
5	6.69	4.35	19.06	0.33	54					0
6	9.33	6.47	37.47	0.49	122	10.17	0.96	11.13	9.21	2
7	6.26	3.61	13.00	1.37	33					0
8	7.09	5.58	27.06	1.78	33					0
9	14.12	4.66	28.20	0.75	410	19.33	9.34	37.02	9.68	5
10	11.29	3.57	16.38	5.65	5					0
11	12.42	6.46	25.93	0.81	76					0
12	13.87	6.81	28.42	3.43	58					0

Table 38: Layer Statistics (Polygon 7, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2	8.04	0.00	8.04	8.04	1					0
3	3.23	2.80	7.25	0.00	11					0
4	1.54	0.00	1.54	1.54	1					0
5	1.56	2.33	9.56	0.35	13					0
6	1.47	0.90	5.71	0.30	145	1.80	1.27	8.47	0.47	75
7	1.90	1.04	6.52	0.28	155	2.87	1.95	9.50	0.31	96
8	1.97	1.19	8.44	0.30	112	4.54	2.58	11.05	0.52	113
9	1.96	1.84	20.90	0.21	211	4.61	4.75	21.11	0.35	91
10	3.53	1.90	8.41	0.21	139	2.88	1.69	7.78	0.28	37
11	3.06	1.97	12.04	0.34	211	4.67	1.72	8.64	1.10	47
12	6.41	1.71	12.39	3.27	43	7.03	0.00	7.03	7.03	1

Table 39: Layer Statistics (Polygon 7, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3					0					0
4					0					0
5					0					0
6					0					0
7	12.55	1.85	14.92	9.48	5					0
8	24.44	0.00	24.44	24.44	1					0
9	14.35	8.45	42.82	0.94	82					0
10					0					0
11	6.69	1.58	12.12	4.56	20					0
12	6.36	0.39	7.05	5.78	9					0

Table 40: Layer Statistics (Polygon 8, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	4.01	0.00	4.01	4.01	1	4.13	0.03	4.16	4.11	2
2					0					0
3	3.59	0.78	6.27	2.49	30	3.70	0.79	4.96	2.27	30
4	1.46	1.30	4.63	0.28	22	2.16	1.59	5.16	0.82	29
5	2.25	2.48	7.55	0.04	10	0.68	0.26	1.18	0.15	9
6	0.43	0.22	0.78	0.12	7	0.51	0.25	0.92	0.04	12
7	1.38	1.04	6.60	0.23	42	1.55	1.36	9.30	0.02	73
8	1.20	0.36	1.93	0.75	15	1.94	1.75	8.16	0.48	17
9	1.15	0.34	2.04	0.76	14	1.31	0.48	2.29	0.64	16
10	2.04	0.94	3.60	0.87	42	2.31	1.33	6.06	0.60	39
11	1.70	0.90	5.06	0.69	27	1.84	0.85	3.11	0.70	13
12	2.00	0.96	4.04	0.92	10	1.34	0.25	1.59	1.09	2

Table 41: Layer Statistics (Polygon 8, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	4.96	0.84	6.12	4.16	3	8.93	0.77	9.69	8.16	2
2					0					0
3	3.97	0.72	4.99	2.92	6	9.85	4.12	19.36	3.18	17
4	2.55	2.43	11.53	0.37	39	12.37	8.19	25.67	1.31	21
5	2.47	2.51	10.50	0.17	15	14.66	6.17	25.14	3.32	13
6	2.15	1.56	5.28	0.07	13	13.58	7.65	25.91	2.24	22
7	3.96	2.92	19.00	0.19	107	13.74	5.43	25.93	2.65	87
8	4.46	2.93	12.27	0.62	21	18.18	8.47	32.87	3.95	39
9	3.87	1.29	5.86	1.53	12	20.34	8.73	32.87	5.46	43
10	5.63	2.02	10.17	1.17	105					0
11	4.98	2.95	12.72	0.55	69	14.87	5.22	27.86	2.20	176
12	3.61	1.36	5.90	1.87	13	14.94	4.86	24.80	5.84	67

Table 42: Layer Statistics (Polygon 9, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.07	1.79	8.92	2.98	10	7.15	1.53	8.97	5.23	3
2	2.77	1.54	4.00	0.60	3	5.72	2.18	10.07	3.95	18
3	7.25	1.44	9.42	4.29	18	6.86	0.87	8.19	4.54	16
4	1.67	2.43	8.20	0.17	15	1.55	2.23	7.93	0.10	26
5	1.03	0.82	4.27	0.13	37	0.90	0.68	3.17	0.04	54
6	1.37	1.37	7.40	0.26	106	1.69	2.17	13.30	0.26	163
7	1.01	0.54	2.16	0.17	37	0.98	0.41	1.99	0.31	39
8	1.99	0.82	3.71	0.55	18	1.90	0.99	4.69	0.08	26
9	1.13	0.58	2.51	0.02	84	1.41	1.15	5.59	0.02	41
10	2.67	1.14	5.07	1.13	33	3.05	1.47	8.39	1.11	67
11	3.09	1.44	7.29	0.13	118	3.54	1.51	9.82	0.56	113
12	4.14	2.84	16.54	1.42	54	3.65	1.44	6.40	1.38	45

Table 43: Layer Statistics (Polygon 9, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.10	1.97	9.22	2.77	19	18.05	7.64	30.51	5.15	44
2	5.83	2.20	9.78	3.00	29	19.28	8.89	34.43	4.61	63
3	6.17	0.21	6.44	5.94	4					0
4	4.59	4.49	25.34	0.26	30	17.03	8.04	31.66	5.21	35
5	3.26	1.89	10.90	0.03	62	19.36	8.37	33.77	3.75	78
6	4.87	6.67	49.00	0.34	121	18.53	8.82	42.94	2.82	205
7	3.52	2.21	9.29	0.16	38	16.51	8.30	35.00	0.82	62
8	4.55	2.05	9.00	1.39	24	17.84	7.74	34.00	3.88	37
9	3.53	2.02	9.79	0.25	31	18.62	7.63	38.07	3.72	123
10	5.88	3.00	14.99	1.41	172	18.46	8.36	34.61	4.86	111
11	5.75	3.32	17.70	0.42	172	20.52	9.01	47.23	3.37	466
12	5.84	2.85	11.95	1.76	67	18.69	8.03	35.65	3.88	224

Table 44: Layer Statistics (Polygon 10, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	5.55	2.02	8.57	2.85	5	6.80	2.13	8.94	4.67	2
2	3.25	0.20	3.45	3.06	2	3.55	0.70	4.32	2.45	4
3	5.13	1.31	6.79	3.03	7	5.06	1.36	6.45	2.66	6
4	3.24	2.43	5.60	0.10	7	3.77	2.80	8.49	0.10	11
5	3.20	4.33	11.83	0.42	5	0.92	0.40	1.36	0.21	8
6	1.36	1.39	7.77	0.22	27	1.49	1.43	7.17	0.25	42
7	0.89	0.45	1.79	0.42	12	1.06	0.41	1.78	0.47	11
8	1.20	0.88	4.01	0.45	13	0.91	0.34	1.53	0.44	12
9	1.86	1.22	5.00	0.53	10	2.36	0.88	4.00	0.81	10
10	3.09	1.33	5.57	1.53	10	4.46	1.37	5.97	2.13	11
11	2.36	1.32	6.75	0.08	49	3.14	2.00	8.85	1.19	41
12	2.71	1.04	4.66	1.46	25	2.30	0.85	5.05	1.46	33

Table 45: Layer Statistics (Polygon 10, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.20	2.69	10.83	3.13	12	13.09	4.74	24.60	5.03	19
2	3.92	0.83	4.85	2.36	6	10.90	5.95	24.83	4.38	9
3	4.67	0.68	5.34	3.99	2	14.91	6.48	25.32	7.45	5
4	2.67	2.27	6.25	0.04	8	10.47	5.47	18.73	1.05	7
5	2.96	2.19	7.41	0.51	15	16.81	7.54	31.51	2.43	26
6	3.14	1.62	7.63	0.62	34	14.15	7.95	31.27	2.61	83
7	4.52	6.33	27.00	1.29	14	14.32	7.26	30.00	4.41	22
8	3.00	1.44	6.26	1.04	12	16.10	8.47	30.51	3.63	16
9	3.93	0.99	5.00	2.04	10	20.15	9.50	31.62	3.13	24
10	5.74	0.79	7.02	4.41	37	11.73	3.78	17.23	6.33	18
11	4.35	2.76	15.26	0.21	77	14.92	6.93	33.30	1.36	181
12	3.17	1.16	6.03	1.51	33	12.12	7.29	31.90	2.19	96

Table 46: Layer Statistics (Polygon 11, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	4.94	1.05	6.98	3.13	21	4.75	1.62	7.04	3.00	4
2	3.92	0.66	4.57	3.26	2	3.71	1.76	5.47	1.95	2
3	6.70	1.58	10.46	4.44	49	6.77	1.41	8.57	4.81	13
4	2.63	2.43	10.22	0.06	105	3.43	2.63	10.57	0.18	151
5	1.14	1.56	6.36	0.08	81	1.06	1.54	5.94	0.12	95
6	2.11	1.81	14.59	0.18	201	1.97	2.07	18.77	0.11	303
7	1.04	0.60	2.98	0.11	95	0.76	0.69	4.36	0.02	114
8	1.18	0.69	4.79	0.15	86	1.15	1.14	6.84	0.20	68
9	1.85	2.50	15.68	0.36	44	1.48	1.89	8.69	0.31	27
10	3.47	0.74	4.54	2.24	10	3.94	1.28	7.38	2.44	10
11	2.74	1.40	7.10	0.10	171	3.26	1.51	7.27	0.09	198
12	3.50	1.50	8.04	0.94	110	3.36	1.35	8.95	1.51	136

Table 47: Layer Statistics (Polygon 11, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	6.02	2.15	11.05	2.93	38	17.95	5.35	30.76	7.64	78
2	3.15	0.00	3.15	3.15	1					0
3	6.01	1.09	8.04	4.49	13	10.92	3.74	16.73	5.84	11
4	5.10	3.15	13.04	0.14	185	13.59	6.92	30.44	0.00	91
5	5.01	3.07	18.00	0.19	82	12.96	7.57	31.59	7.14	28
6	5.68	4.71	39.66	0.07	212	21.50	10.46	49.34	1.58	292
7	4.08	2.56	11.99	0.11	99	15.23	9.46	36.34	1.00	72
8	3.79	2.34	9.57	0.52	65	17.67	9.28	38.51	2.02	82
9	4.80	3.36	14.00	0.92	44	21.15	10.73	36.80	2.83	46
10	5.52	2.14	8.39	3.42	5	15.15	9.81	35.36	3.50	8
11	5.73	2.88	16.11	0.02	255	20.18	9.62	47.09	0.81	537
12	5.73	2.25	14.15	1.66	150	18.27	8.51	43.01	4.03	267

Table 48: Layer Statistics (Polygon 12, silicate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.25	0.45	7.88	6.85	3	7.86	0.00	7.86	7.86	1
2					0					0
3	7.27	2.00	11.98	4.10	27	7.29	0.80	8.09	6.49	2
4	3.29	3.63	12.33	0.51	23	3.58	3.19	11.35	0.56	35
5	3.06	2.81	8.46	0.13	44	3.78	2.86	8.80	0.15	66
6	3.21	4.65	24.10	0.26	43	1.68	2.73	15.01	0.00	61
7	2.91	3.13	16.87	0.07	47	2.79	3.39	15.44	0.20	57
8	1.62	1.09	5.57	0.39	36	2.26	2.42	9.05	0.07	38
9	2.27	3.93	27.51	0.53	48	1.79	1.15	6.32	0.69	32
10	4.23	0.01	4.24	4.22	2	4.72	0.09	4.81	4.64	2
11	4.73	5.09	37.00	1.13	55	4.12	1.36	6.48	1.15	64
12	3.37	1.14	6.63	1.71	42	3.67	1.26	7.70	1.78	57

Table 49: Layer Statistics (Polygon 12, silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	7.35	0.49	7.91	6.43	7	20.25	8.08	27.62	7.14	7
2	3.25	2.75	6.00	0.50	2					0
3	6.98	1.80	10.93	5.30	8	17.77	9.07	33.72	9.41	5
4	5.60	3.89	11.89	0.56	15	21.21	11.64	43.25	5.52	15
5	4.99	2.58	9.88	0.31	33	11.33	5.37	23.12	4.45	9
6	4.56	5.46	26.69	0.22	45	16.90	10.13	40.66	3.16	41
7	5.77	6.11	31.60	0.05	47	18.79	10.11	42.00	2.69	25
8	4.44	2.60	11.64	0.36	36	19.17	11.04	40.42	3.21	49
9	4.50	2.54	10.87	0.96	28	20.68	12.95	42.79	5.35	26
10	6.64	0.00	6.64	6.64	1	10.42	0.00	10.42	10.42	1
11	6.49	2.57	16.32	0.92	87	19.66	10.24	40.99	4.57	86
12	4.25	1.99	9.66	1.62	60	15.87	9.95	36.28	3.49	75

Table 50: Layer Statistics (Polygon 1, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.62	0.51	1.25	0.00	13	1.16	0.06	1.25	1.10	3
2	1.23	0.23	1.66	0.49	134	1.17	0.32	1.79	0.10	65
3	1.27	0.23	2.27	0.78	199	1.26	0.25	1.98	0.50	89
4	0.95	0.20	1.18	0.00	60	0.99	0.20	1.31	0.00	63
5	0.78	0.37	2.05	0.00	246	0.99	0.31	1.50	0.00	212
6	0.57	0.27	1.22	0.00	384	0.85	0.30	1.97	0.00	263
7	0.58	0.37	1.87	0.02	329	0.88	0.31	1.85	0.09	166
8	0.40	0.32	1.53	0.00	364	0.74	0.35	1.85	0.00	265
9	0.58	0.44	1.85	0.00	176	0.96	0.39	1.70	0.13	106
10	1.33	0.57	2.93	0.07	174	1.47	0.52	2.76	0.44	84
11	1.41	0.46	2.69	0.37	144	1.40	0.47	2.85	0.60	102
12	1.07	0.34	2.75	0.54	219	1.07	0.35	2.14	0.54	128

Table 51: Layer Statistics (Polygon 1, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	1.36	0.16	1.61	1.15	9	2.09	0.25	2.54	1.72	21
2	1.17	0.19	1.59	0.73	52	1.68	0.36	2.38	0.55	49
3	1.18	0.28	1.80	0.58	67	1.72	0.42	2.80	0.94	65
4	1.03	0.19	1.47	0.67	33	1.56	0.55	2.60	0.00	31
5	1.10	0.28	1.73	0.50	88	1.65	0.50	2.61	0.72	145
6	0.94	0.31	2.03	0.37	142	1.54	0.49	2.64	0.51	168
7	1.13	0.28	1.77	0.32	198	1.61	0.46	2.74	0.23	172
8	1.01	0.37	2.36	0.23	162	1.64	0.56	3.00	0.22	137
9	0.98	0.40	1.93	0.44	74	1.74	0.53	2.81	0.44	86
10	1.59	0.43	2.57	0.79	63	1.97	0.55	2.96	1.01	50
11	1.52	0.56	2.65	0.58	57	2.14	0.50	2.96	0.66	128
12	1.21	0.37	2.20	0.59	90	2.09	0.52	2.90	0.16	203

Table 52: Layer Statistics (Polygon 2, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.97	0.61	2.52	0.00	16	1.36	0.24	1.74	1.12	8
2	0.96	0.21	1.51	0.12	52	0.94	0.21	1.53	0.39	35
3	1.34	0.25	2.63	0.98	76	1.32	0.23	1.78	0.89	36
4	0.97	0.18	1.18	0.52	22	0.92	0.21	1.44	0.52	22
5	0.62	0.34	1.38	0.04	87	0.73	0.34	1.77	0.14	105
6	0.34	0.25	1.39	0.00	254	0.53	0.29	1.29	0.00	261
7	0.16	0.09	0.47	0.03	89	0.78	0.37	1.54	0.16	40
8	0.26	0.18	1.11	0.00	175	0.52	0.26	1.26	0.13	151
9	0.37	0.26	0.92	0.00	59	0.61	0.27	1.26	0.19	27
10	0.78	0.23	1.38	0.38	115	0.85	0.35	2.32	0.33	69
11	1.15	0.38	2.04	0.42	127	0.97	0.35	2.12	0.41	119
12	0.85	0.32	2.09	0.34	96	0.85	0.37	2.24	0.43	69

Table 53: Layer Statistics (Polygon 2, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	1.12	0.18	1.44	0.74	14	1.97	0.35	2.80	1.41	23
2	0.99	0.22	1.64	0.57	40	1.71	0.25	2.17	1.17	80
3	1.20	0.22	1.75	0.90	18	1.77	0.31	2.46	1.21	49
4	1.10	0.16	1.42	0.92	14	1.68	0.32	2.24	1.07	15
5	0.91	0.27	1.42	0.05	46	1.68	0.36	2.22	0.65	58
6	0.93	0.25	1.74	0.15	147	1.58	0.41	2.44	0.21	230
7	1.01	0.30	1.92	0.54	37	1.69	0.45	2.72	0.70	80
8	1.00	0.32	1.70	0.29	90	1.74	0.44	2.79	0.59	147
9	1.13	0.30	1.94	0.69	22	1.71	0.38	2.41	0.20	65
10	1.17	0.39	2.15	0.61	38	1.86	0.58	3.00	0.83	94
11	1.19	0.31	1.92	0.46	133	2.01	0.33	2.94	0.76	301
12	0.98	0.28	1.63	0.50	71	1.86	0.41	3.00	0.67	183

Table 54: Layer Statistics (Polygon 3, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.82	0.30	1.31	0.00	16	1.33	0.63	2.81	0.90	7
2	0.96	0.24	1.44	0.13	17	1.04	0.26	1.56	0.73	10
3	1.11	0.18	1.44	0.87	25	1.24	0.22	1.71	0.92	11
4	0.71	0.27	1.15	0.33	44	0.76	0.30	1.71	0.29	58
5	0.35	0.25	1.33	0.02	107	0.59	0.28	1.42	0.18	141
6	0.33	0.20	0.96	0.07	148	0.65	0.27	1.22	0.09	177
7	0.26	0.17	0.88	0.03	74	0.67	0.28	2.09	0.13	79
8	0.30	0.15	0.97	0.05	144	0.64	0.23	1.29	0.21	145
9	0.41	0.27	1.30	0.00	60	0.67	0.33	1.45	0.17	49
10	0.50	0.18	0.91	0.22	24	0.75	0.31	1.35	0.09	22
11	0.82	0.29	2.00	0.32	89	0.81	0.29	2.62	0.34	104
12	0.85	0.18	1.40	0.44	98	0.90	0.21	1.62	0.47	84

Table 55: Layer Statistics (Polygon 3, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	1.34	0.32	2.30	0.89	18	1.93	0.25	2.44	1.50	22
2	1.07	0.31	2.08	0.83	14	1.81	0.32	2.48	1.10	26
3	1.30	0.31	1.88	0.90	8	1.88	0.39	2.46	1.18	20
4	1.15	0.36	1.77	0.00	35	1.78	0.35	2.24	0.90	43
5	1.01	0.36	2.06	0.26	59	1.75	0.39	2.52	0.80	87
6	1.06	0.29	1.82	0.37	106	1.68	0.40	2.46	0.63	173
7	1.09	0.29	1.93	0.39	48	1.69	0.43	2.70	0.84	74
8	1.08	0.29	1.69	0.48	80	1.75	0.44	2.66	0.70	124
9	0.98	0.37	1.71	0.28	38	1.82	0.46	2.57	0.58	70
10	1.19	0.34	2.02	0.73	12	1.76	0.42	2.57	0.25	32
11	1.22	0.28	2.01	0.28	137	1.91	0.30	2.60	0.83	332
12	1.20	0.32	1.88	0.35	108	1.94	0.37	2.96	0.88	254

Table 56: Layer Statistics (Polygon 4, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.78	0.08	0.91	0.68	11	0.80	0.04	0.85	0.75	4
2	0.92	0.16	1.15	0.73	8	0.94	0.11	1.12	0.78	7
3	1.02	0.22	1.41	0.55	9	0.94	0.00	0.94	0.94	1
4	0.68	0.17	0.91	0.36	11	0.69	0.20	1.03	0.34	19
5	0.52	0.30	1.39	0.12	35	0.61	0.25	1.43	0.25	46
6	0.31	0.15	1.02	0.10	76	0.45	0.20	1.05	0.16	112
7	0.21	0.04	0.32	0.14	28	0.34	0.15	0.71	0.17	36
8	0.32	0.12	0.82	0.10	86	0.43	0.16	0.95	0.15	55
9	0.43	0.17	0.83	0.16	75	0.49	0.20	1.07	0.22	24
10					0					0
11	0.61	0.16	1.14	0.32	116	0.59	0.15	1.17	0.21	114
12	0.66	0.11	0.94	0.47	57	0.66	0.11	0.91	0.46	67

Table 57: Layer Statistics (Polygon 4, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.98	0.27	1.50	0.69	17	1.61	0.19	1.96	0.95	50
2	0.89	0.15	1.19	0.55	12	1.59	0.24	2.21	1.01	33
3	0.96	0.00	0.96	0.96	1	1.46	0.18	1.64	1.27	2
4	0.79	0.22	1.08	0.39	12	1.34	0.31	1.77	0.70	10
5	0.85	0.30	1.68	0.35	23	1.68	0.33	2.05	0.76	34
6	0.87	0.27	1.55	0.25	80	1.52	0.34	2.30	0.16	113
7	0.81	0.20	1.27	0.40	35	1.33	0.38	2.10	0.61	29
8	0.85	0.27	1.46	0.23	49	1.32	0.31	2.24	0.47	46
9	1.13	0.31	2.08	0.60	31	1.71	0.29	2.29	0.88	68
10					0					0
11	1.00	0.21	1.67	0.56	186	1.66	0.28	2.38	0.91	507
12	0.97	0.24	1.73	0.56	94	1.59	0.32	2.52	0.96	248

Table 58: Layer Statistics (Polygon 5, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3	0.96	0.16	1.27	0.53	14					0
4	0.90	0.19	1.30	0.66	16	1.07	0.43	1.99	0.53	10
5	0.36	0.18	0.78	0.14	31	0.46	0.21	1.07	0.14	42
6	0.20	0.14	0.84	0.00	131	0.51	0.24	1.03	0.10	137
7	0.26	0.23	1.98	0.04	115	0.45	0.23	1.06	0.10	106
8	0.25	0.16	0.90	0.01	62	0.52	0.29	1.27	0.08	66
9	0.36	0.14	0.69	0.12	174	0.65	0.40	1.51	0.15	50
10	0.53	0.21	1.59	0.30	38	0.55	0.15	1.11	0.32	25
11	0.74	0.12	0.90	0.21	30	0.75	0.08	0.95	0.61	29
12	0.77	0.18	1.31	0.55	18	0.76	0.13	1.15	0.57	22

Table 59: Layer Statistics (Polygon 5, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3					0					0
4	1.32	0.62	2.76	0.75	22					0
5	1.06	0.21	1.53	0.62	48					0
6	1.12	0.29	1.90	0.20	89	1.32	0.00	1.32	1.32	1
7	1.18	0.32	1.75	0.39	49					0
8	1.23	0.25	1.81	0.41	57	1.29	0.11	1.45	1.21	3
9	1.37	0.30	1.96	0.23	182	1.41	0.29	1.78	0.91	8
10	1.08	0.35	1.79	0.47	45					0
11	1.11	0.30	1.71	0.66	44	1.50	0.00	1.50	1.50	1
12	0.99	0.29	1.72	0.69	26					0

Table 60: Layer Statistics (Polygon 6, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.85	0.00	0.85	0.85	1	0.84	0.00	0.84	0.84	1
2	0.82	0.35	1.45	0.28	6	0.90	0.04	0.95	0.85	3
3	0.92	0.16	1.17	0.61	35					0
4	2.03	0.64	2.54	0.92	8	1.65	0.82	2.51	0.49	7
5	0.42	0.26	1.42	0.17	66	0.46	0.26	1.41	0.17	84
6	0.27	0.13	0.81	0.02	197	0.45	0.21	1.19	0.06	280
7	0.37	0.55	2.34	0.08	29	0.40	0.18	0.91	0.11	30
8	0.24	0.09	0.52	0.10	91	0.43	0.23	0.98	0.03	92
9	0.37	0.18	1.14	0.08	380	0.59	0.35	1.46	0.12	59
10	0.47	0.10	0.77	0.34	15	0.51	0.10	0.74	0.40	10
11	0.64	0.16	1.14	0.16	73	0.65	0.14	0.99	0.33	77
12	0.63	0.16	1.04	0.23	56	0.65	0.13	1.07	0.27	67

Table 61: Layer Statistics (Polygon 6, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.84	0.00	0.84	0.84	1					0
2	0.82	0.17	1.10	0.50	14					0
3					0					0
4	1.90	0.69	2.60	0.92	6	1.67	0.15	1.82	1.52	2
5	0.93	0.28	1.46	0.20	54					0
6	1.00	0.30	1.89	0.09	134	1.11	0.11	1.22	1.00	2
7	1.02	0.33	1.47	0.40	30					0
8	0.95	0.33	1.44	0.16	35					0
9	1.28	0.22	1.87	0.22	406	1.39	0.27	1.89	1.09	5
10	0.99	0.28	1.29	0.54	5					0
11	1.14	0.34	2.14	0.48	76					0
12	1.14	0.33	1.68	0.50	57					0

Table 62: Layer Statistics (Polygon 7, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2	0.79	0.00	0.79	0.79	1					0
3	0.44	0.19	0.72	0.08	11					0
4	0.46	0.00	0.46	0.46	1					0
5	0.38	0.07	0.47	0.18	11					0
6	0.34	0.12	0.74	0.08	145	0.36	0.13	0.79	0.19	75
7	0.46	0.37	2.55	0.09	154	0.58	0.38	2.99	0.13	96
8	0.37	0.24	1.78	0.10	111	0.54	0.21	1.03	0.06	113
9	0.40	0.20	1.74	0.09	211	0.56	0.27	1.27	0.15	92
10	0.65	0.29	2.39	0.22	133	0.66	0.27	1.53	0.32	37
11	0.55	0.24	2.64	0.08	211	0.60	0.17	1.10	0.08	47
12	0.65	0.10	1.00	0.45	42	0.67	0.00	0.67	0.67	1

Table 63: Layer Statistics (Polygon 7, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1					0					0
2					0					0
3					0					0
4					0					0
5					0					0
6					0					0
7	1.18	0.12	1.38	1.07	5					0
8	1.19	0.00	1.19	1.19	1					0
9	1.01	0.43	1.69	0.19	82					0
10					0					0
11	0.73	0.12	1.06	0.57	20					0
12	0.61	0.03	0.66	0.58	9					0

Table 64: Layer Statistics (Polygon 8, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.56	0.00	0.56	0.56	1	0.56	0.07	0.63	0.49	2
2					0					0
3	0.62	0.07	0.79	0.50	30	0.61	0.07	0.76	0.47	30
4	0.47	0.13	0.77	0.31	22	0.48	0.14	0.81	0.31	28
5	0.39	0.14	0.68	0.25	10	0.53	0.18	0.90	0.31	9
6	0.44	0.12	0.70	0.19	18	0.50	0.11	0.69	0.18	32
7	0.38	0.10	0.66	0.21	36	0.39	0 12	0.96	0.12	66
8	0.45	0.11	0.63	0.26	15	0.47	0.15	0.75	0.18	17
9	0.46	0.14	0.58	0.08	15	0.50	0.25	1.10	0.12	19
10	0.53	0.11	0.97	0.40	41	0.55	0.13	1.02	0.36	38
11	0.50	0.13	0.81	0.24	34	0.52	0.15	0.77	0.22	14
12	0.49	0.11	0.69	0.31	10	0.42	0.07	0.49	0.36	2

Table 65: Layer Statistics (Polygon 8, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.65	0.26	0.90	0.30	3	1.09	0.10	1.19	0.99	2
2					0					0
3	0.57	0.01	0.58	0.55	6	1.02	0.23	1.40	0.57	17
4	0.70	0.22	1.12	0.31	39	1.17	0.40	1.87	0.37	21
5	0.78	0.34	1.51	0.24	15	1.36	0.22	1.68	0.96	13
6	0.70	0.18	1.13	0.21	39	1.28	0.30	1.88	0.72	54
7	0.69	0.21	1.26	0.10	102	1.29	0.31	1.96	0.56	83
8	0.85	0.32	1.56	0.35	20	1.61	0.30	2.00	1.01	35
9	0.82	0.30	1.23	0.21	15	1.54	0.34	1.88	0.46	45
10	0.99	0.20	1.30	0.11	105					0
11	0.96	0.21	1.34	0.46	74	1.37	0.24	1.92	0.84	176
12	0.70	0.19	0.94	0.40	13	1.37	0.25	1.97	0.79	66

Table 66: Layer Statistics (Polygon 9, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.85	0.15	1.03	0.56	10	0.88	0.16	1.02	0.66	3
2	0.83	0.09	0.95	0.73	3	0.82	0.12	1.12	0.65	18
3	0.93	0.21	1.74	0.70	19	0.86	0.09	0.98	0.67	16
4	0.44	0.15	0.83	0.31	15	0.49	0.17	0.94	0.26	26
5	0.51	0.15	0.84	0.25	38	0.53	0.20	1.01	0.17	56
6	0.42	0.13	0.73	0.14	115	0.46	0.14	0.76	0.06	175
7	0.28	0.10	0.58	0.12	36	0.37	0.14	0.79	0.13	38
8	0.27	0.17	0.62	0.11	18	0.36	0.17	0.67	0.11	25
9	0.35	0.18	0.72	0.07	86	0.39	0.24	1.07	0.09	42
10	0.46	0.06	0.60	0.38	33	0.53	0.16	1.08	0.34	65
11	0.55	0.14	1.05	0.24	121	0.55	0.16	1.09	0.15	123
12	0.62	0.22	1.37	0.23	55	0.60	0.20	1.41	0.23	45

Table 67: Layer Statistics (Polygon 9, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.82	0.15	1.06	0.55	19	1.34	0.29	1.78	0.70	44
2	0.85	0.11	1.05	0.68	29	1.45	0.28	2.01	0.79	63
3	0.80	0.07	0.88	0.70	4					0
4	0.76	0.24	1.60	0.32	30	1.32	0.32	1.82	0.48	36
5	0.88	0.21	1.34	0.27	66	1.54	0.39	2.79	0.52	89
6	0.84	0.21	1.36	0.29	130	1.47	0.32	2.29	0.64	219
7	0.68	0.20	1.10	0.29	38	1.27	0.27	1.80	0.77	60
8	0.88	0.25	1.29	0.42	24	1.51	0.38	1.99	0.71	36
9	0.73	0.28	1.35	0.14	31	1.43	0.29	1.87	0.52	123
10	0.80	0.24	1.26	0.35	172	1.35	0.24	1.73	0.87	111
11	0.84	0.26	1.54	0.33	190	1.50	0.32	2.36	0.59	473
12	0.81	0.24	1.82	0.46	70	1.40	0.28	2.10	0.78	226

Table 68: Layer Statistics (Polygon 10, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.78	0.20	1.07	0.49	5	0.93	0.14	1.07	0.79	2
2	0.97	0.27	1.24	0.70	2	0.70	0.03	0.73	0.66	4
3	0.73	0.09	0.84	0.58	7	0.77	0.14	0.97	0.58	6
4	0.62	0.47	1.59	0.11	7	0.56	0.18	0.80	0.26	10
5	0.77	0.63	2.27	0.29	7	0.60	0.13	0.88	0.34	10
6	0.45	0.16	0.74	0.15	28	0.52	0.16	0.82	0.23	45
7	0.26	0.09	0.39	0.05	12	0.34	0.11	0.60	0.14	11
8	0.50	0.22	0.92	0.13	12	0.57	0.13	0.85	0.34	11
9	0.45	0.14	0.57	0.15	10	0.55	0.19	0.89	0.24	10
10	0.64	0.09	0.76	0.49	10	0.80	0.11	0.96	0.61	11
11	0.55	0.15	0.84	0.33	50	0.64	0.24	1.36	0.28	44
12	0.47	0.20	0.88	0.03	25	0.47	0.07	0.56	0.36	33

Table 69: Layer Statistics (Polygon 10, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.82	0.25	1.18	0.52	12	1.20	0.28	1.59	0.69	19
2	0.75	0.05	0.83	0.69	6	1.17	0.26	1.67	0.79	9
3	0.81	0.03	0.83	0.78	2	1.30	0.22	1.56	1.02	5
4	0.86	0.64	2.50	0.37	8	1.26	0.31	1.81	0.79	7
5	0.86	0.16	1.21	0.63	17	1.56	0.39	2.97	0.87	30
6	0.82	0.19	1.16	0.30	37	1.40	0.35	1.98	0.37	78
7	0.69	0.25	1.46	0.39	14	1.17	0.25	1.53	0.70	22
8	0.98	0.21	1.30	0.59	11	1.53	0.37	1.98	0.66	15
9	0.64	0.25	1.17	0.46	10	1.37	0.51	1.92	0.54	24
10	0.93	0.06	1.03	0.83	37	1.18	0.16	1.45	0.99	18
11	0.82	0.21	1.51	0.47	81	1.35	0.28	2.33	0.64	182
12	0.61	0.16	0.94	0.35	33	1.08	0.28	1.73	0.38	96

Table 70: Layer Statistics (Polygon 11, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.80	0.37	2.33	0.47	21	0.73	0.12	0.93	0.60	4
2	0.86	0.24	1.11	0.62	2	0.57	0.03	0.60	0.54	2
3	0.88	0.12	1.53	0.65	49	0.91	0.04	0.98	0.83	13
4	0.54	0.19	1.17	0.24	105	0.60	0.19	1.03	0.28	148
5	0.34	0.15	0.82	0.15	83	0.36	0.15	0.77	0.15	88
6	0.35	0.10	0.62	0.10	198	0.41	0.12	0.91	0.12	300
7	0.26	0.14	1.17	0.01	97	0.31	0.13	0.84	0.02	116
8	0.39	0.14	0.69	0.08	130	0.43	0.21	1.32	0.08	92
9	0.34	0.18	0.86	0.13	51	0.28	0.08	0.50	0.17	38
10	0.63	0.08	0.72	0.50	10	0.68	0.11	0.95	0.52	10
11	0.56	0.16	1.56	0.10	176	0.57	0.14	1.09	0.15	209
12	0.59	0.11	0.91	0.06	109	0.58	0.10	0.84	0.39	134

Table 71: Layer Statistics (Polygon 11, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.82	0.18	1.23	0.55	38	1.41	0.17	1.75	0.96	78
2	0.65	0.00	0.65	0.65	1					0
3	0.88	0.07	0.95	0.71	13	1.17	0.18	1.42	0.93	11
4	0.74	0.23	1.52	0.36	181	1.22	0.45	2.18	0.00	99
5	0.68	0.23	1.65	0.20	54	1.19	0.32	1.81	0.78	23
6	0.78	0.21	1.31	0.13	211	1.36	0.31	1.97	0.45	284
7	0.75	0.20	1.28	0.37	99	1.25	0.38	2.00	0.17	73
8	0.85	0.31	1.46	0.10	87	1.54	0.44	2.38	0.64	83
9	0.69	0.28	1.26	0.24	52	1.41	0.44	2.36	0.66	46
10	0.84	0.18	1.07	0.65	5	1.32	0.44	2.13	0.69	8
11	0.90	0.25	1.88	0.21	277	1.47	0.33	2.23	0.46	553
12	0.86	0.20	1.40	0.36	148	1.39	0.33	2.27	0.60	262

Table 72: Layer Statistics (Polygon 12, phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.83	0.02	0.85	0.81	3	0.82	0.00	0.82	0.82	1
2					0					0
3	0.87	0.09	1.10	0.62	27	0.89	0.06	0.95	0.83	2
4	0.64	0.49	2.15	0.16	25	0.66	0.49	2.22	0.31	36
5	0.47	0.23	0.87	0.21	46	0.56	0.23	0.98	0.23	68
6	0.31	0.17	1.07	0.14	42	0.39	0.14	0.79	0.17	61
7	0.29	0.17	0.83	0.04	45	0.43	0.19	0.90	0.15	56
8	0.33	0.14	0.81	0.14	36	0.51	0.22	1.18	0.26	38
9	0.42	0.15	1.10	0.18	57	0.40	0.09	0.54	0.20	35
10	0.69	0.01	0.70	0.67	2	0.78	0.01	0.79	0.77	2
11	0.68	0.34	1.94	0.25	55	0.59	0.12	1.00	0.30	68
12	0.57	0.11	0.89	0.34	37	0.64	0.24	2.03	0.42	51

Table 73: Layer Statistics (Polygon 12, phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
Month	mean	sd	max	min	num-pts	mean	sd	max	min	num-pts
1	0.82	0.05	0.88	0.74	7	1.48	0.38	1.86	0.86	7
2	1.10	0.10	1.20	1.00	2					0
3	0.95	0.10	1.17	0.81	8	1.40	0.35	1.93	0.98	5
4	0.93	0.55	2.16	0.38	18	1.47	0.52	2.31	0.77	11
5	0.76	0.18	1.12	0.36	35	1.20	0.41	2.03	0.65	10
6	0.76	0.19	1.21	0.43	45	1.26	0.33	1.94	0.63	38
7	0.72	0.22	1.17	0.31	48	1.31	0.32	1.97	0.76	25
8	0.87	0.27	1.33	0.29	36	1.54	0.42	2.26	0.68	48
9	0.76	0.26	1.20	0.32	30	1.50	0.46	2.31	0.66	28
10	1.02	0.00	1.02	1.02	1	1.22	0.00	1.22	1.22	1
11	0.90	0.24	1.39	0.32	89	1.42	0.39	2.07	0.40	85
12	0.67	0.20	1.33	0.34	56	1.27	0.40	2.02	0.69	71

Table 74: Fit to seasonal cycle (nitrate, 0-10m & 10-30m)

	0-10m					10-30m				
polygon-#	mean	amp	phase	r^2	#-pts	mean	amp	phase	r^2	#-pts
1	8.084	4.542	2.75	0.30	2680	9.608	2.272	3.00	0.10	1715
2	4.826	4.867	2.25	0.43	1154	5.312	2.963	2.25	0.19	937
3	3.006	3.253	2.00	0.36	845	4.383	1.806	1.75	0.11	890
4	1.925	2.579	2.00	0.36	497	2.186	1.713	2.25	0.24	473
5	1.390	1.927	2.25	0.34	569	2.452	1.189	2.25	0.10	472
6	1.219	1.613	2.00	0.24	913	1.712	1.078	0.75	0.15	709
7	0.732	0.792	1.50	0.16	834	0.695	0.262	0.25	0.06	382
8	0.873	1.051	2.50	0.32	268	0.919	0.926	2.75	0.22	302
9	1.416	2.389	2.00	0.39	516	1.523	1.889	2.00	0.35	583
10	1.723	1.974	2.25	0.25	164	1.908	1.504	1.50	0.22	190
11	1.481	1.972	2.25	0.41	995	1.422	1.620	2.25	0.28	1128
12	1.924	2.140	2.75	0.38	342	2.113	0.970	2.50	0.10	398

Table 75: Fit to seasonal cycle (nitrate, 30-100m & 100m-btm)

	30-100m					100m-btm				
polygon-#	mean	amp	phase	r^2	#-pts	mean	amp	phase	r^2	#-pts
1	9.922	0.511	0.50	0.02	1081	17.337	1.734	0.50	0.07	1314
2	8.155	1.394	0.75	0.09	673	18.089	1.797	0.75	0.05	1319
3	9.864	1.487	1.25	0.07	672	19.686	2.042	1.25	0.09	1226
4	7.090	0.659	0.25	0.05	523	18.554	1.205	1.50	0.02	1126
5	8.523	0.282	9.25	0.01	520	12.843	3.256	6.25	0.22	11
6	7.407	1.645	0.00	0.13	759	11.776	1.896	3.50	0.08	12
7	4.396	2.753	7.00	0.12	103					0
8	3.216	1.153	0.50	0.07	615	13.824	2.763	12.00	0.09	537
9	4.867	1.029	1.75	0.03	752	16.696	1.057	1.50	0.02	1414
10	4.783	0.539	11.50	0.05	260	14.157	1.270	8.75	0.01	504
11	5.358	0.593	0.50	0.04	1144	15.659	1.044	11.50	0.02	1477
12	5.252	0.274	9.75	0.00	354	14.301	0.483	9.75	0.00	330

Table 76: Fit to seasonal cycle (silicate, 0-10m & 10-30m)

	0-10m					10-30m				
polygon-#	mean	amp	phase	r^2	#-pts	mean	amp	phase	r^2	#-pts
1	11.998	6.421	3.00	0.26	758	12.556	5.384	3.25	0.24	873
2	7.227	6.430	3.00	0.35	599	6.411	4.872	3.00	0.23	671
3	4.418	3.169	2.75	0.18	754	4.967	2.355	2.50	0.11	841
4	3.005	2.111	2.75	0.24	460	3.297	1.961	3.00	0.08	453
5	2.650	1.668	3.00	0.13	622	3.747	0.595	11.75	0.03	486
6	2.382	1.554	2.25	0.21	917	3.133	0.889	0.00	0.05	698
7	2.512	1.226	0.75	0.18	1042	3.643	1.164	11.25	0.07	460
8	1.877	0.756	2.25	0.17	220	1.973	0.733	1.75	0.13	242
9	2.369	1.889	1.75	0.34	533	2.475	1.443	1.25	0.27	611
10	2.353	1.579	2.25	0.22	172	2.458	1.296	1.75	0.19	191
11	2.463	1.762	2.25	0.24	975	2.388	1.638	2.00	0.19	1121
12	3.461	1.118	2.25	0.07	370	3.095	1.234	2.25	0.07	415

Table 77: Fit to seasonal cycle (silicate, 30-100m & 100m-btm)

	30-100m					100m-btm				
polygon-#	mean	amp	phase	r^2	#-pts	mean	amp	phase	r^2	#-pts
1	11.623	1.154	2.50	0.03	501	29.086	3.878	0.25	0.07	561
2	8.793	2.270	2.00	0.05	498	29.694	4.352	1.00	0.10	803
3	10.399	2.188	2.25	0.08	631	30.157	4.393	1.75	0.06	1107
4	7.059	0.000	0.00	0.00	511	23.987	0.864	10.25	0.00	1095
5	13.060	1.408	9.50	0.03	561	17.776	3.395	0.25	0.15	14
6	11.937	3.404	11.50	0.14	812	17.647	4.520	0.50	0.09	9
7	12.438	6.076	7.00	0.16	117					0
8	4.340	0.977	11.25	0.10	403	15.053	1.782	9.50	0.04	487
9	5.180	1.461	1.00	0.02	769	19.121	0.937	1.00	0.00	1448
10	4.116	0.763	11.00	0.03	260	14.305	2.533	8.75	0.03	506
11	5.290	1.146	2.25	0.01	1149	19.016	2.022	9.25	0.01	1512
12	5.289	0.000	0.00	0.00	369	18.236	1.668	9.25	0.00	339

Table 78: Fit to seasonal cycle (phosphate, 0-10m & 10-30m)

	0-10m					10-30m				
polygon-#	mean	amp	phase	r^2	#-pts	mean	amp	phase	r^2	#-pts
1	0.819	0.352	1.50	0.29	2442	0.993	0.186	1.00	0.12	1546
2	0.624	0.468	1.75	0.46	1168	0.727	0.212	1.75	0.18	942
3	0.507	0.299	1.50	0.44	846	0.711	0.140	1.50	0.09	887
4	0.486	0.216	1.75	0.43	512	0.540	0.178	2.25	0.23	485
5	0.363	0.162	1.00	0.23	629	0.547	0.096	0.25	0.05	487
6	0.415	0.212	1.75	0.19	957	0.514	0.067	1.00	0.07	710
7	0.470	0.145	0.50	0.10	1031	0.539	0.082	11.25	0.05	461
8	0.482	0.081	1.50	0.16	232	0.487	0.061	1.50	0.09	257
9	0.480	0.210	2.25	0.33	549	0.512	0.150	2.25	0.18	632
10	0.527	0.116	2.50	0.07	175	0.568	0.053	1.00	0.04	197
11	0.464	0.187	1.75	0.37	1031	0.475	0.169	2.00	0.27	1154
12	0.495	0.221	2.00	0.27	375	0.527	0.113	2.00	0.11	418

Table 79: Fit to seasonal cycle (phosphate, 30-100m & 100m-btm)

	30-100m					100m-btm				
polygon-#	mean	amp	phase	r^2	#-pts	mean	amp	phase	r^2	#-pts
1	1.132	0.152	0.00	0.09	1035	1.779	0.296	12.00	0.15	1255
2	1.037	0.074	11.50	0.05	670	1.793	0.159	11.75	0.09	1325
3	1.131	0.117	1.50	0.05	663	1.829	0.105	1.00	0.06	1257
4	0.943	0.076	11.25	0.05	540	1.606	0.048	1.00	0.02	1140
5	1.209	0.103	9.25	0.03	562	1.381	0.078	0.25	0.02	13
6	1.158	0.144	11.25	0.09	818	1.389	0.167	1.50	0.11	9
7	0.941	0.325	7.00	0.17	117					0
8	0.824	0.147	11.50	0.19	431	1.356	0.131	9.50	0.06	512
9	0.819	0.000	0.00	0.00	803	1.444	0.000	0.00	0.00	1480
10	0.805	0.057	8.25	0.02	268	1.299	0.111	7.75	0.05	505
11	0.809	0.071	11.50	0.05	1166	1.401	0.093	10.25	0.03	1520
12	0.800	0.045	2.25	0.00	375	1.380	0.065	9.00	0.01	329

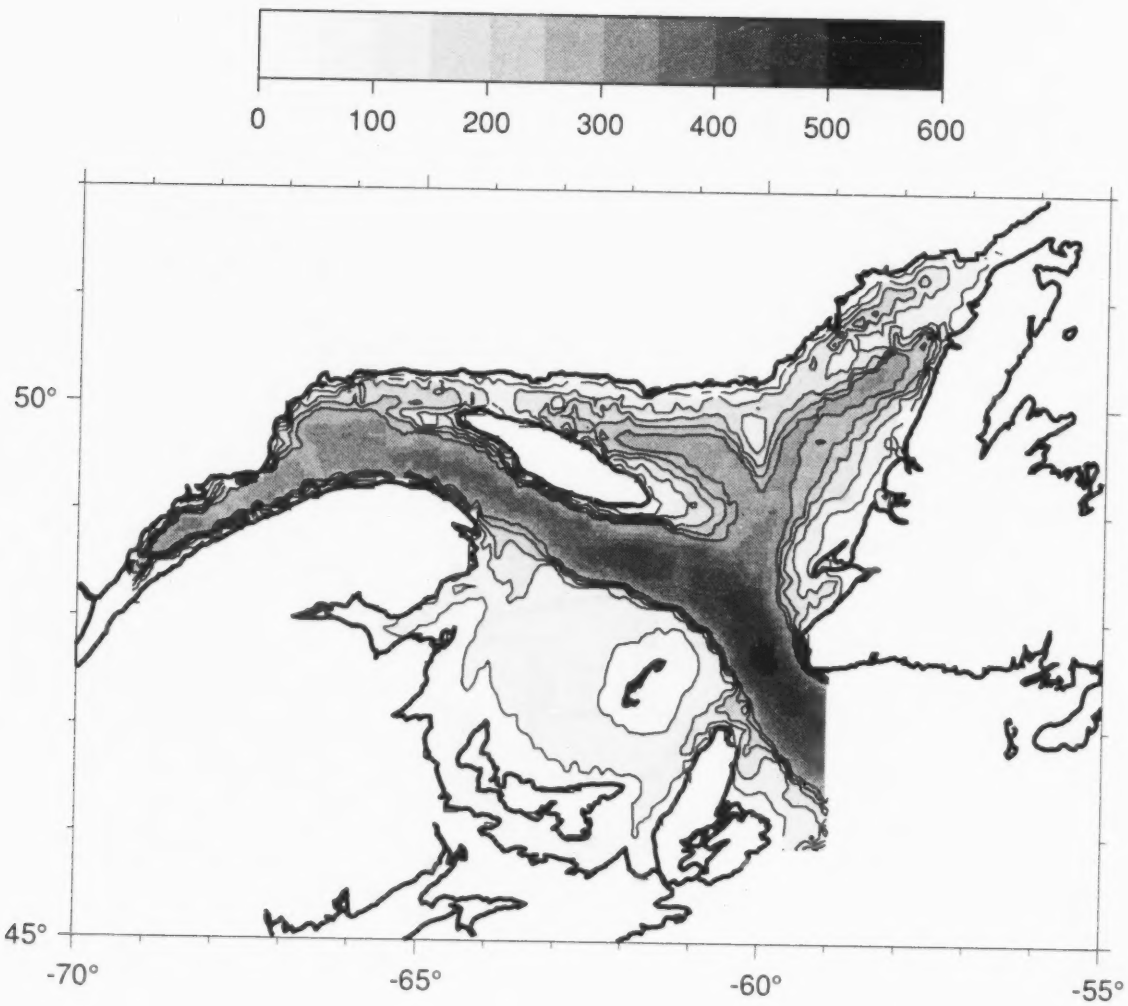

Figure 1: Bathymetry (in m) of Gulf of St. Lawrence based on grid used in optimal estimation routine. Isolines are 50, 100, 150, 200, and 250 meters.

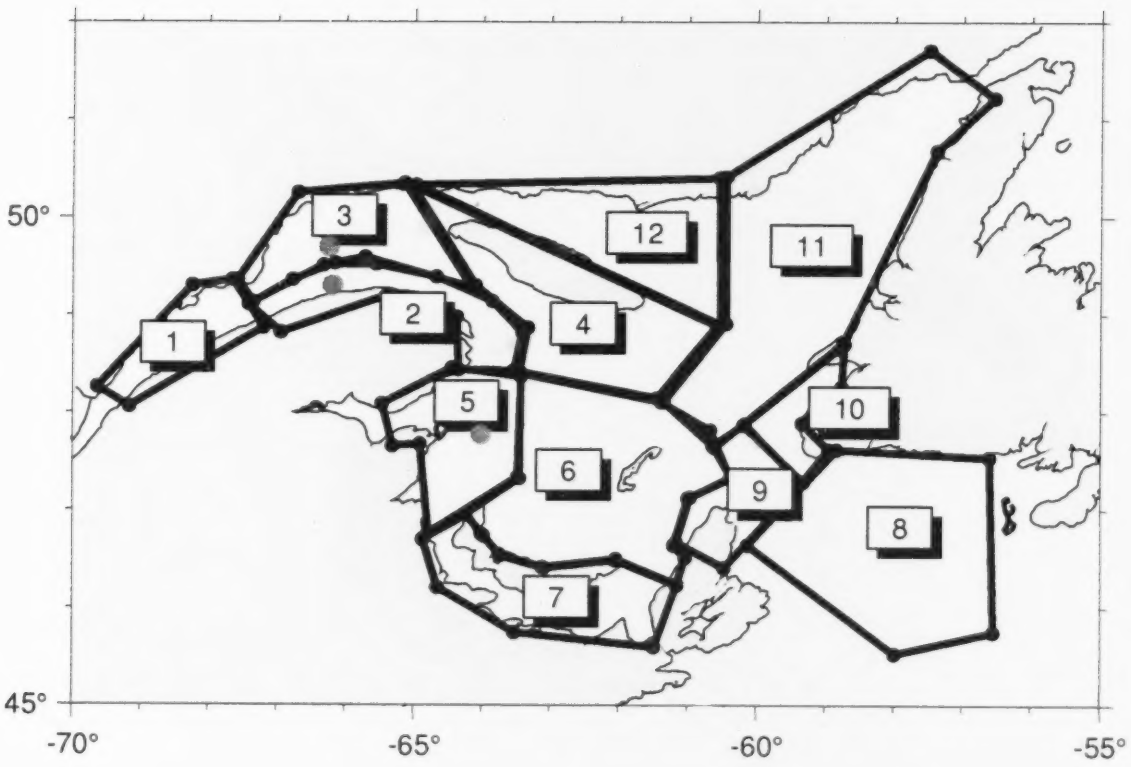

Figure 2: GSL statistical subareas: (1) lower estuary; (2) Gaspé; (3) Anticosti west; (4) Anticosti south; (5) Shediac; (6) Magdalen Shallows; (7) Northumberland Strait; (8) Laurentian Channel; (9) Cabot Strait west; (10) Cabot Strait east; (11) Esquiman; (12) Anticosti north.

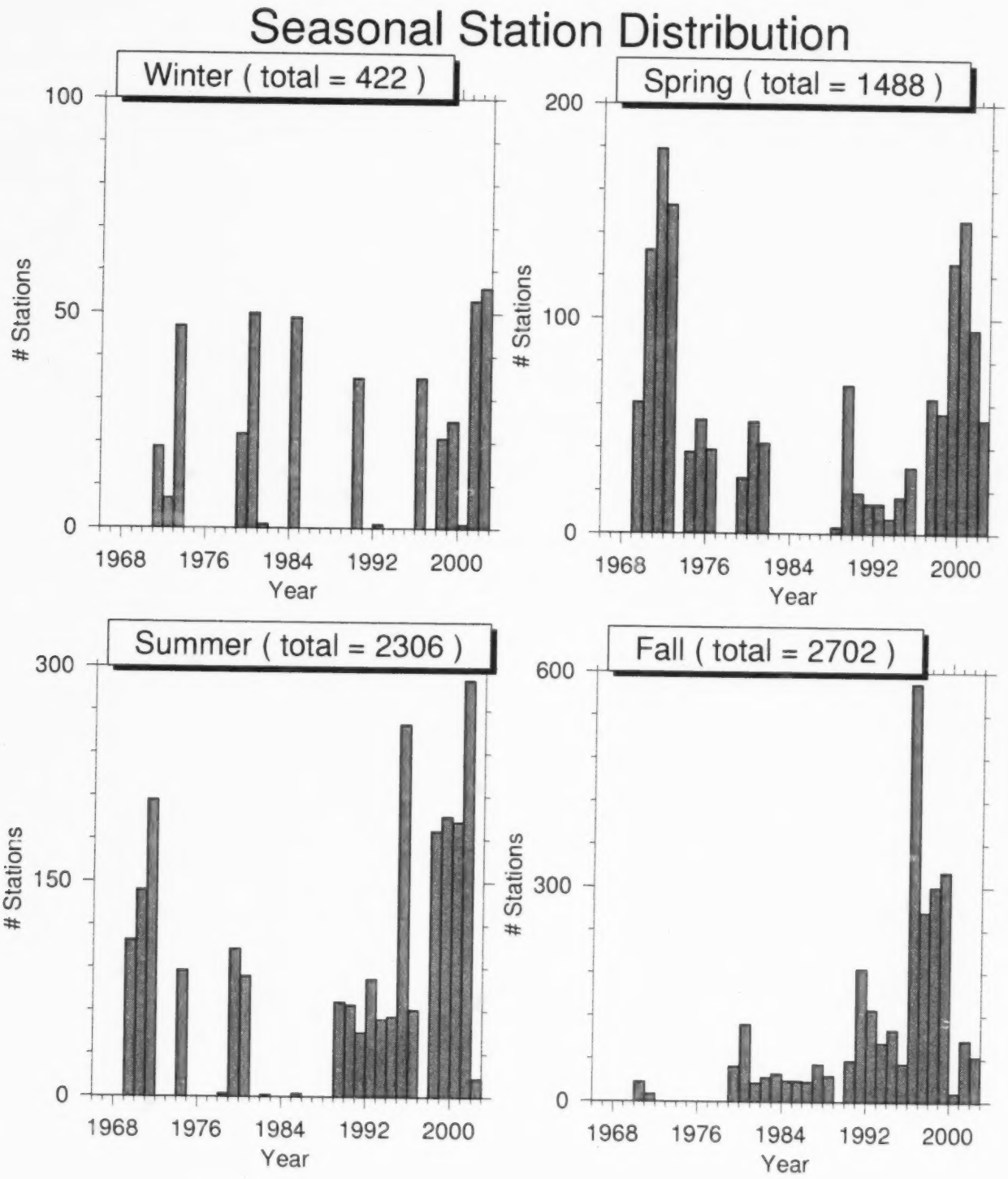

Figure 3: Seasonal station distribution.

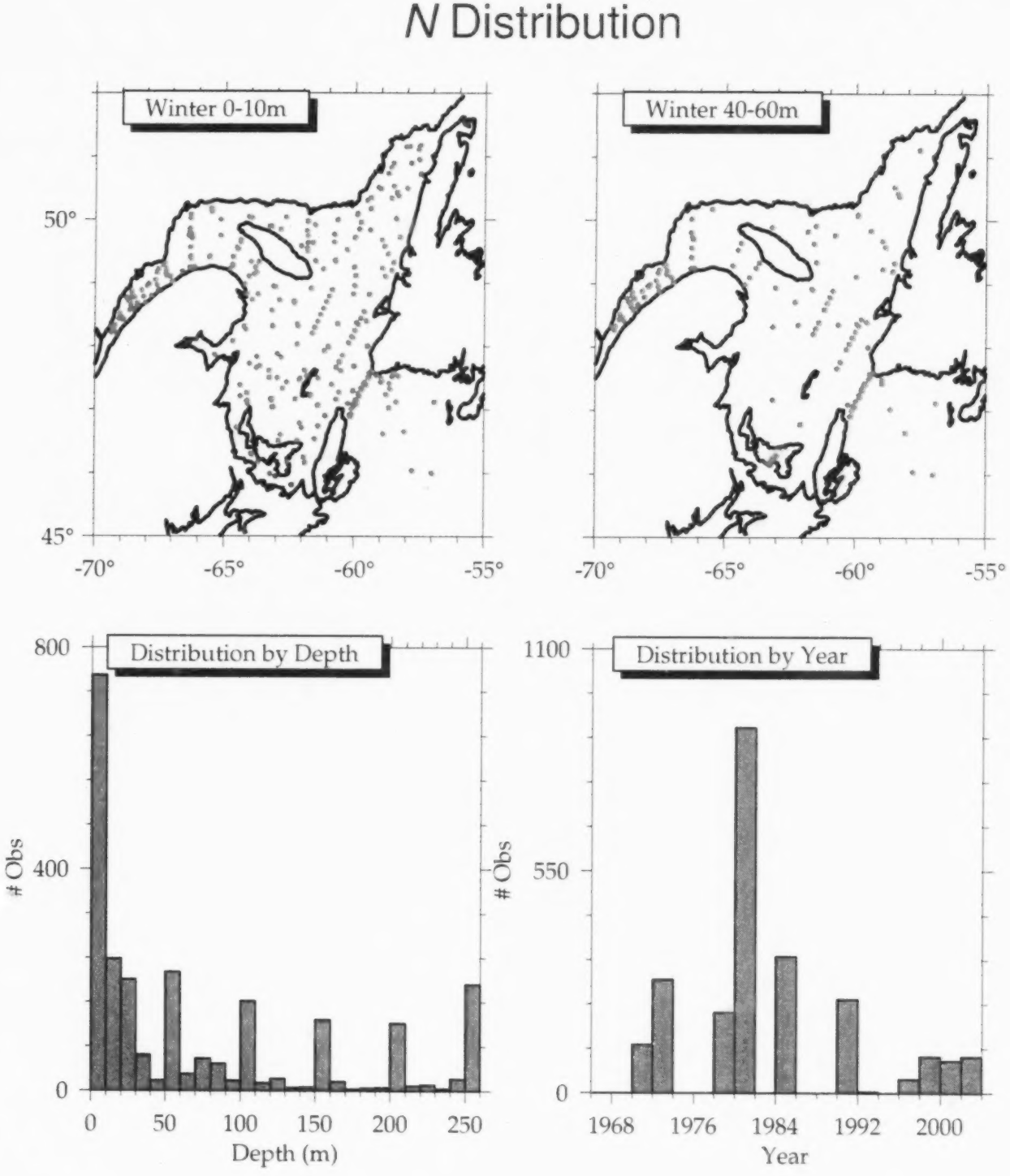

Figure 4: Data distribution for winter.

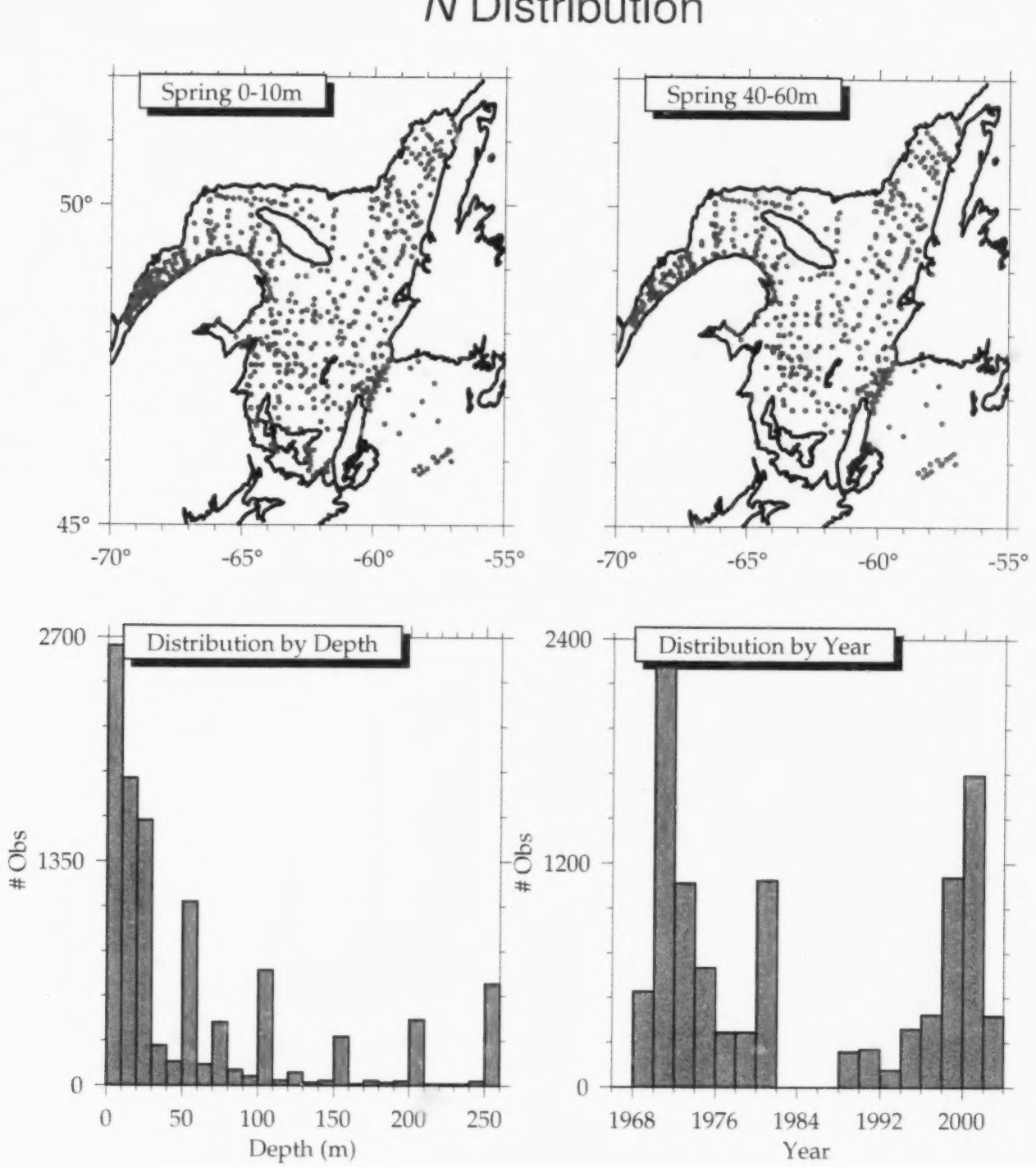

Figure 5: Data distribution for spring.

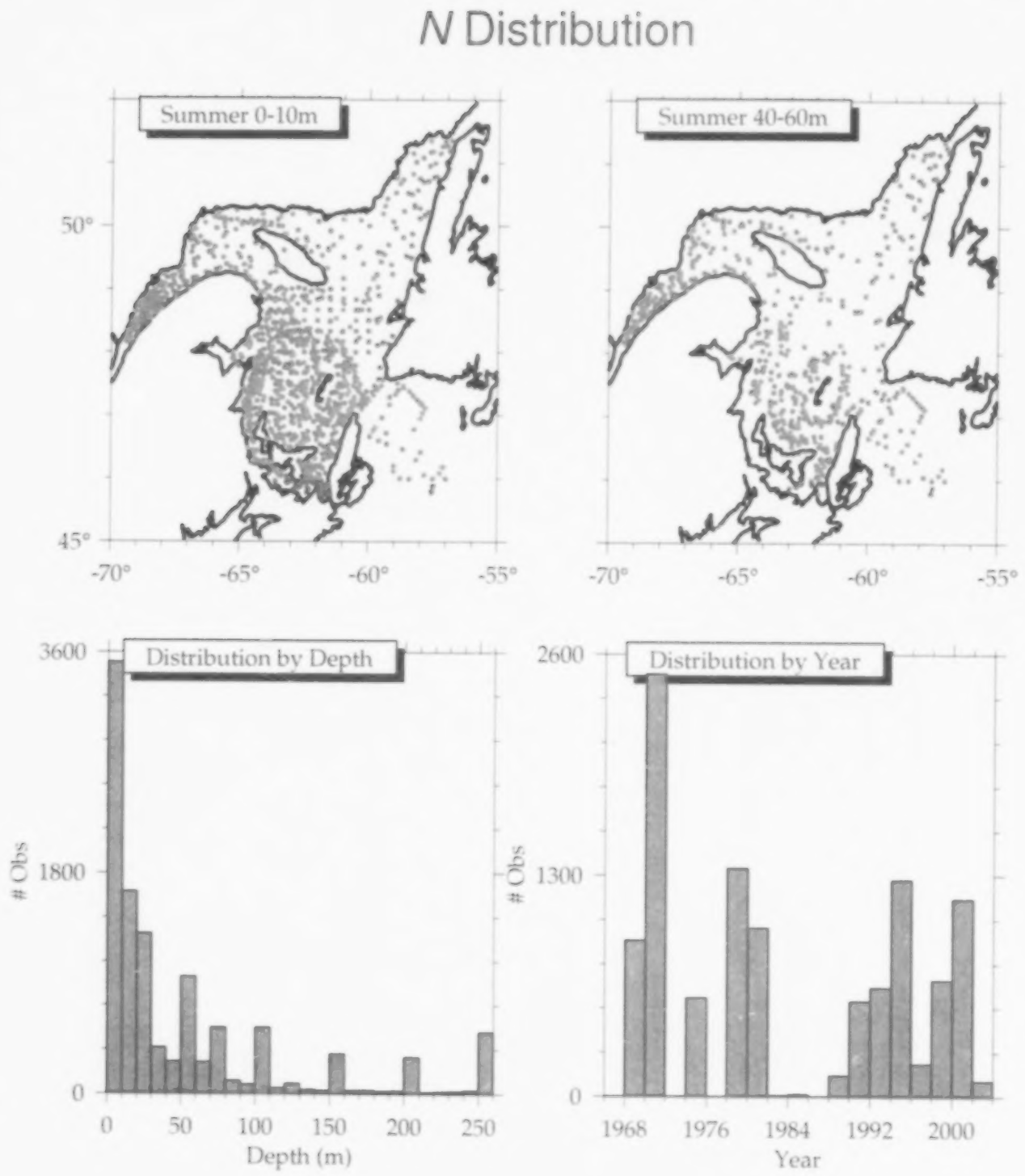

Figure 6: Data distribution for summer.

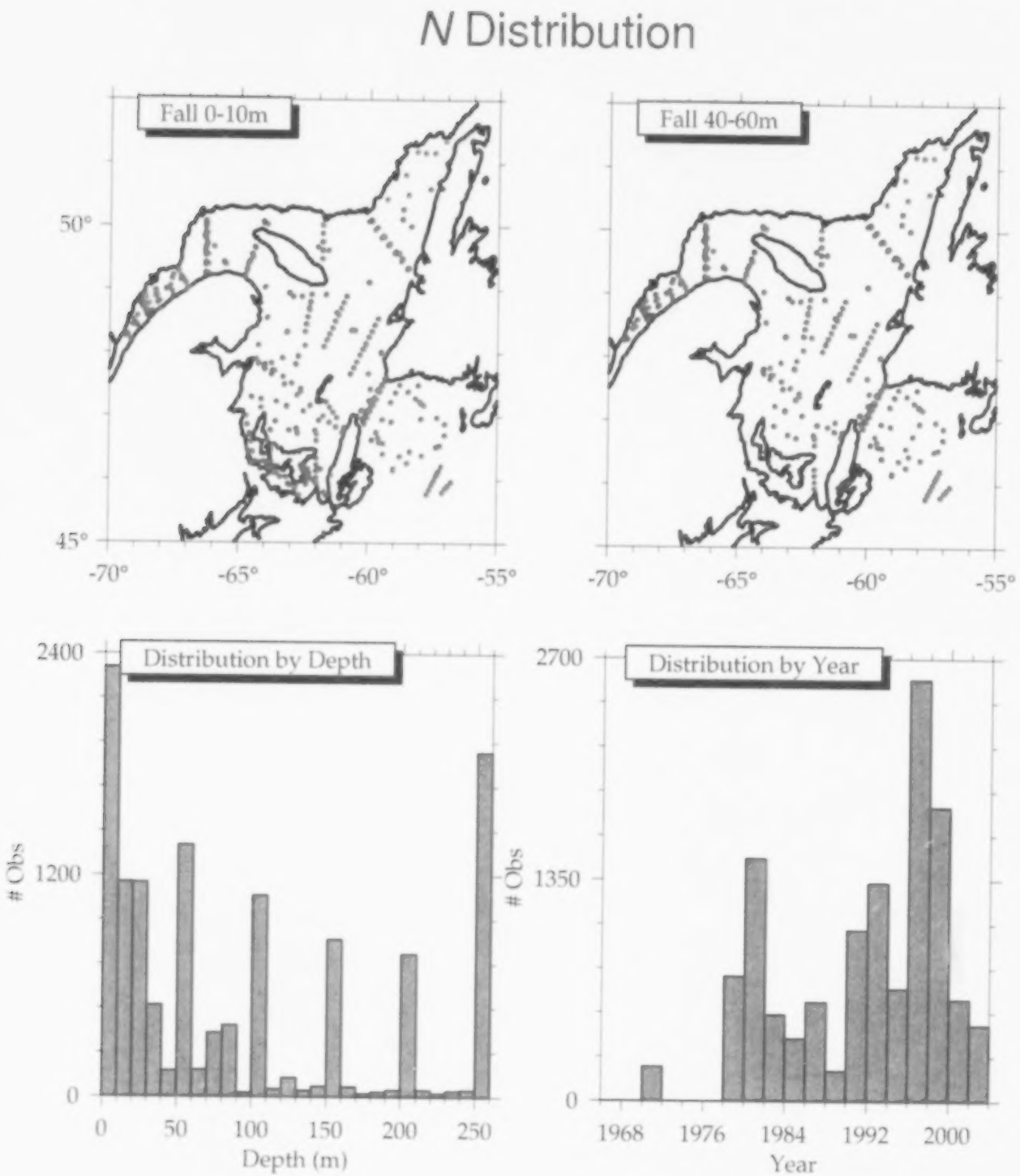

Figure 7: Data distribution for fall.

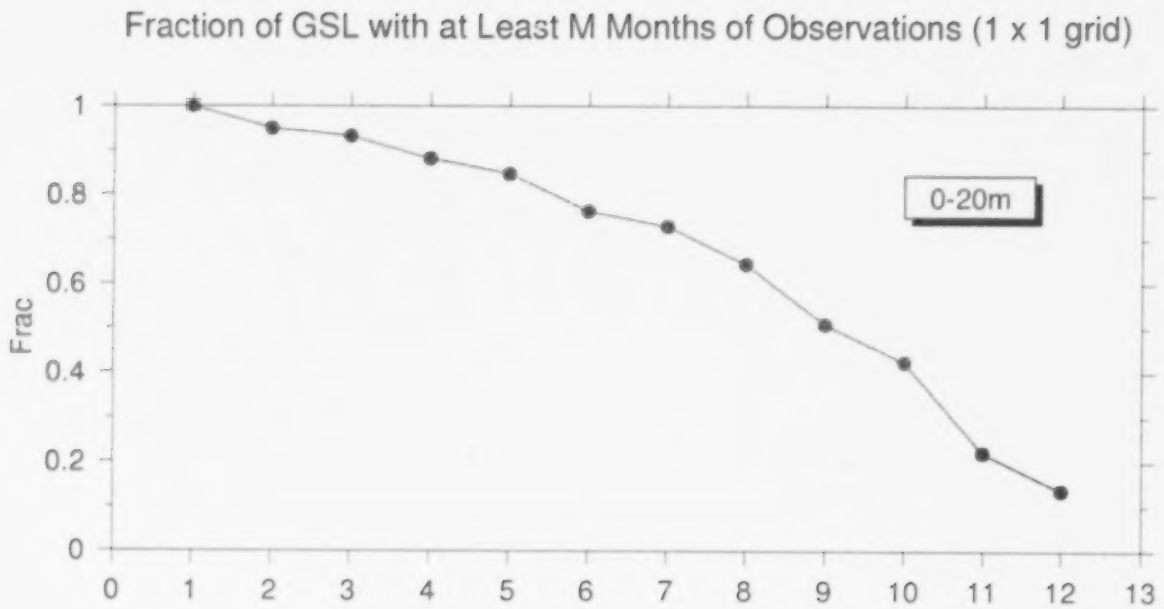

Figure 8: Fraction of GSL covered by at least "M" months of data.

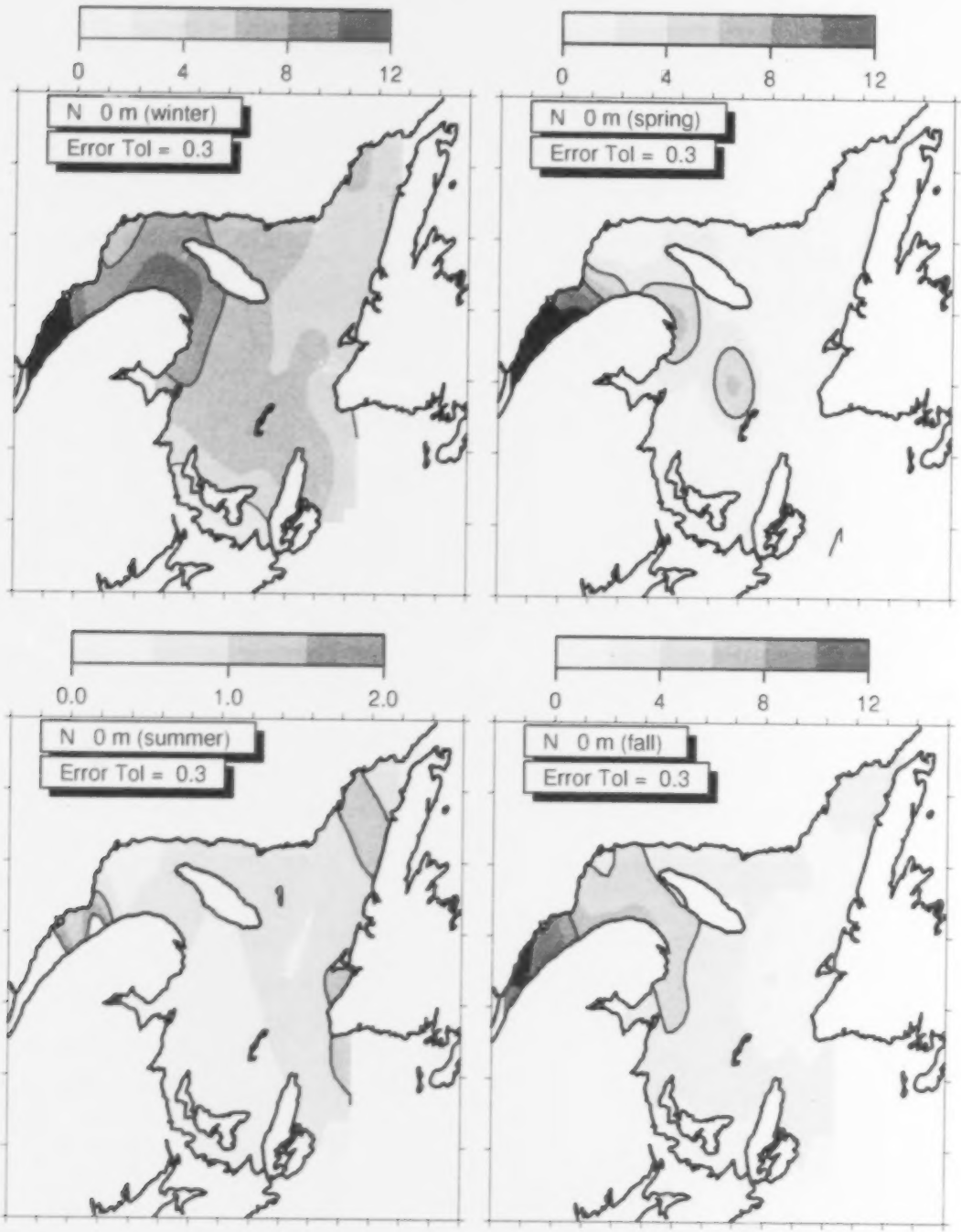

Figure 9: Seasonal optimally estimated surface nitrate concentration (μM) for the Gulf of St. Lawrence. Note that the scale for the summer months is lower than for the other seasons.

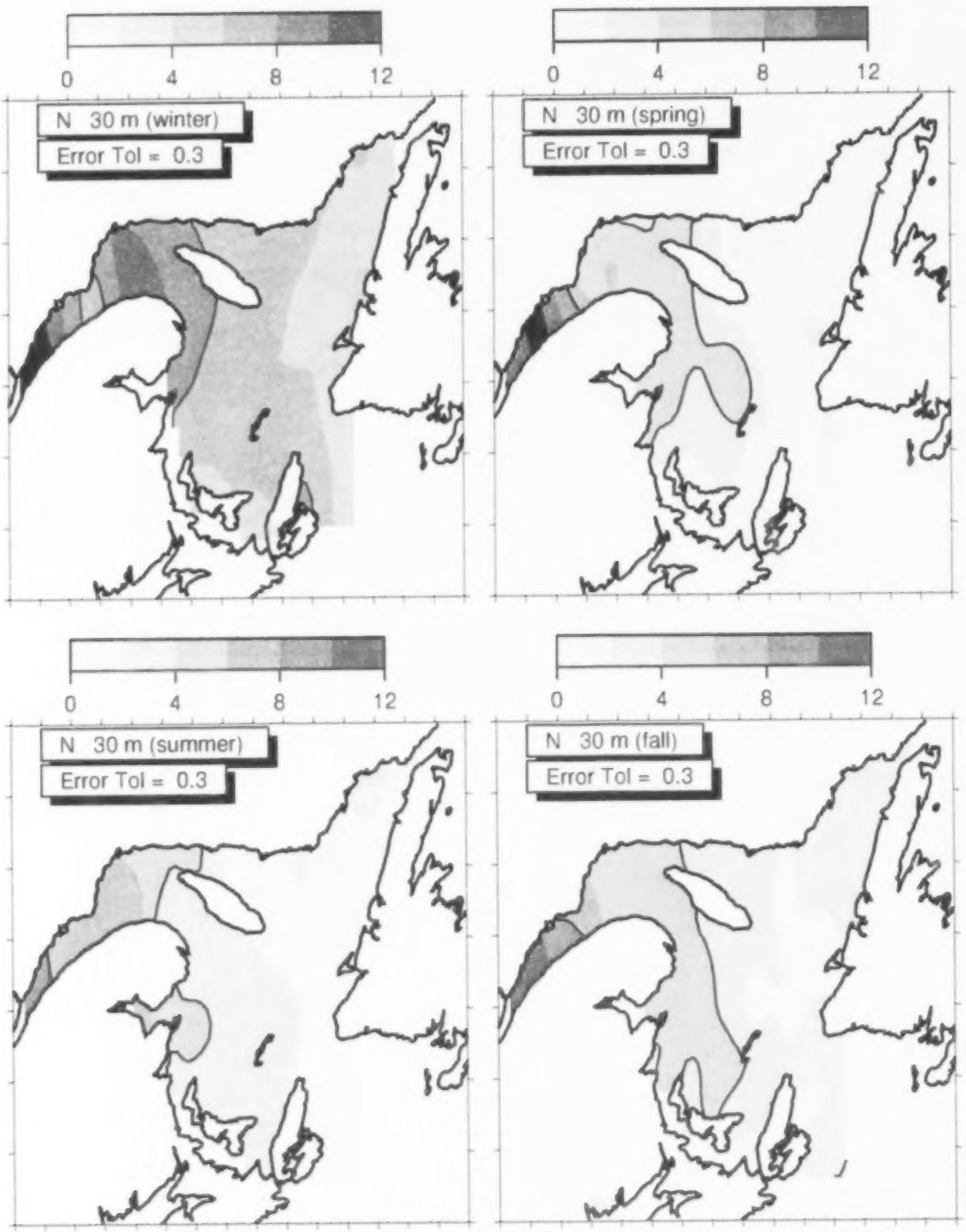

Figure 10: Seasonal optimally estimated 30m nitrate concentration (μM) for the Gulf of St. Lawrence.

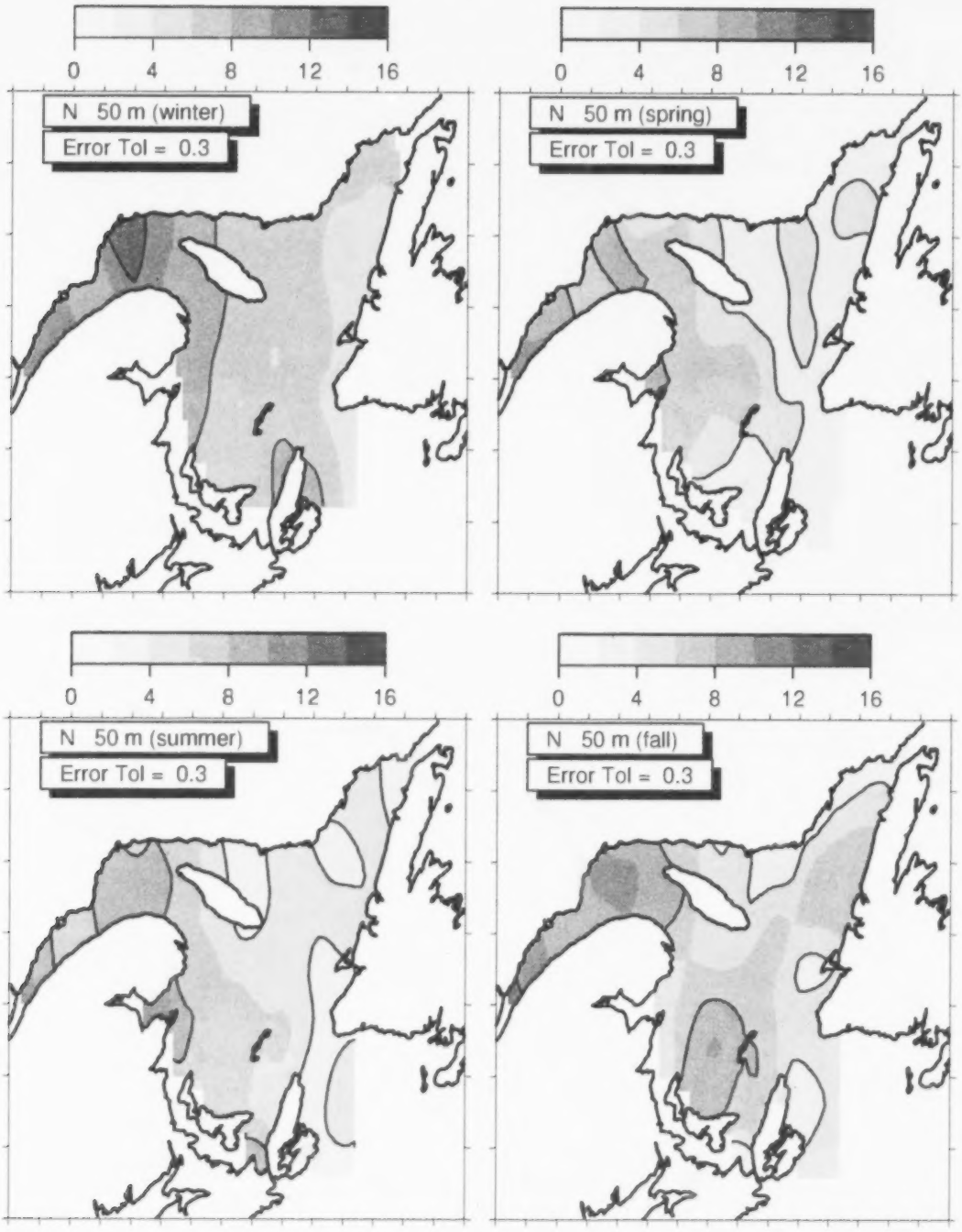

Figure 11: Seasonal optimally estimated 50m nitrate concentration (μM) for the Gulf of St. Lawrence.

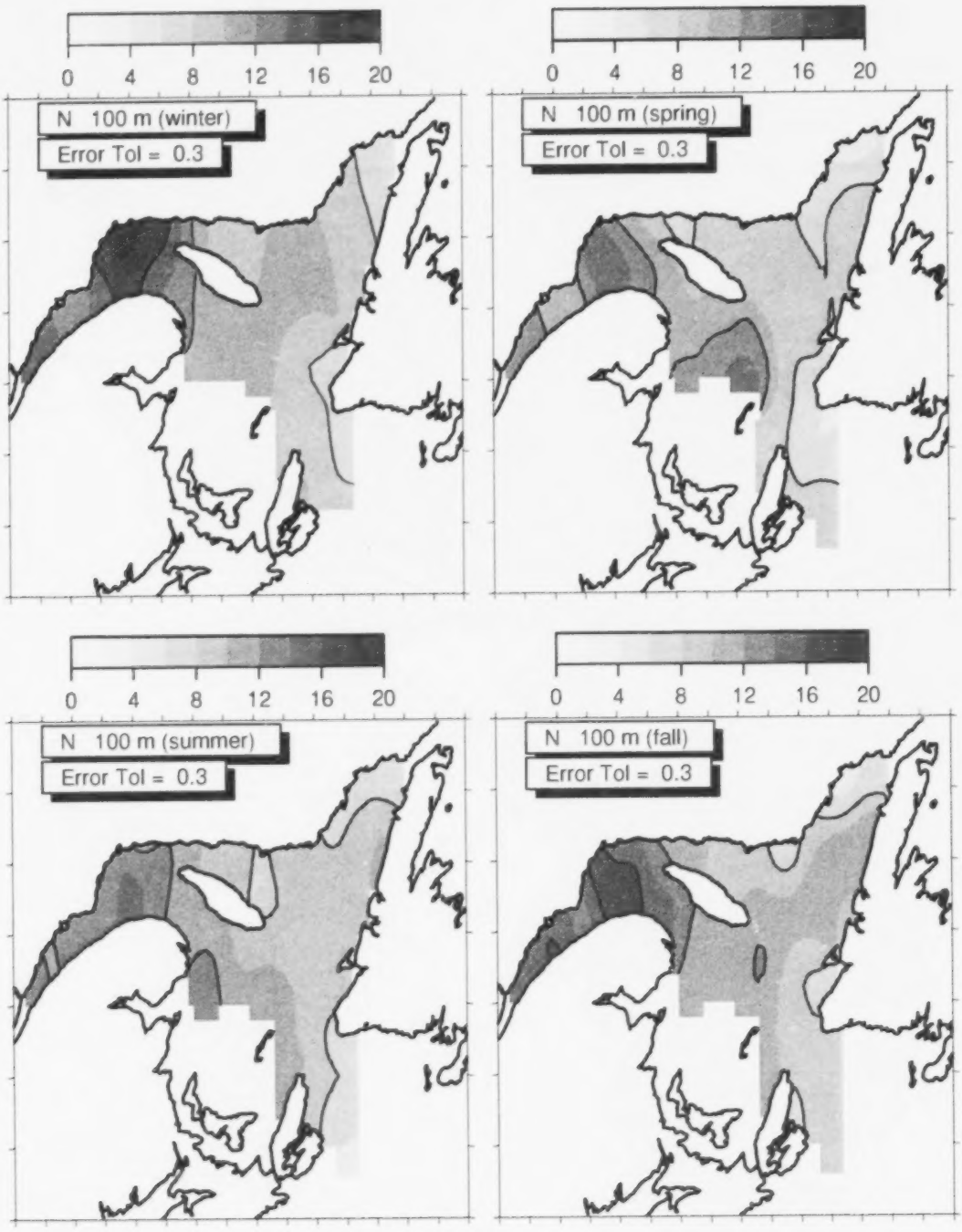
0 4 8 12 16 20
N 100 m (winter)
Error Tol = 0.3
0 4 8 12 16 20
N 100 m (spring)
Error Tol = 0.3
0 4 8 12 16 20
N 100 m (summer)
Error Tol = 0.3
0 4 8 12 16 20
N 100 m (fall)
Error Tol = 0.3

Figure 12: Seasonal optimally estimated 100m nitrate concentration (μM) for the Gulf of St. Lawrence.

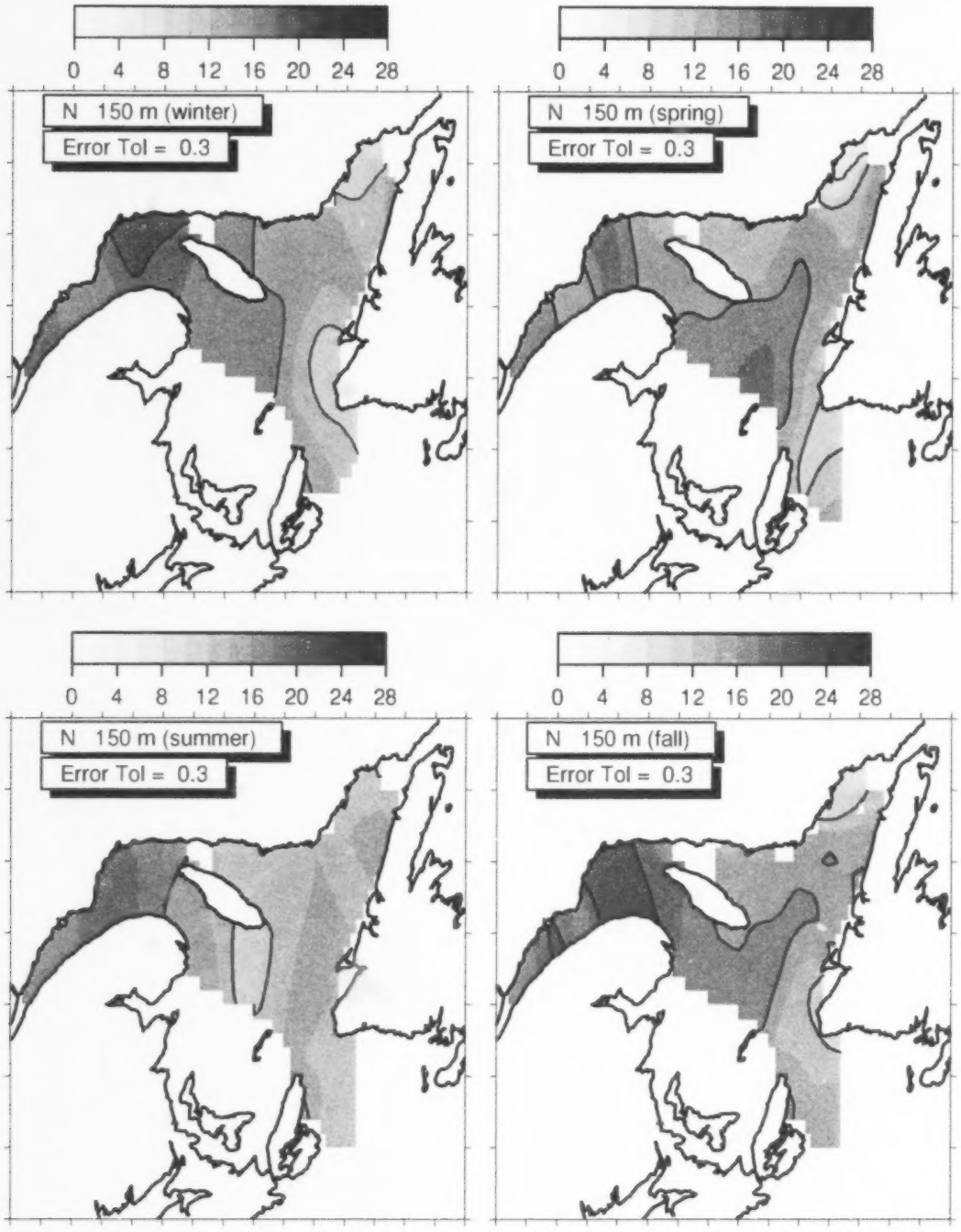

Figure 13: Seasonal optimally estimated 150m nitrate concentration (μM) for the Gulf of St. Lawrence.

0 4 8 12 16 20 24 28
N btm (winter)
Error Tol = 0.3
0 4 8 12 16 20 24 28
N btm (spring)
Error Tol = 0.3
0 4 8 12 16 20 24 28
N btm (summer)
Error Tol = 0.3
0 4 8 12 16 20 24 28
N btm (fall)
Error Tol = 0.3

Figure 14: Seasonal optimally estimated bottom nitrate concentration (μM) for the Gulf of St. Lawrence.

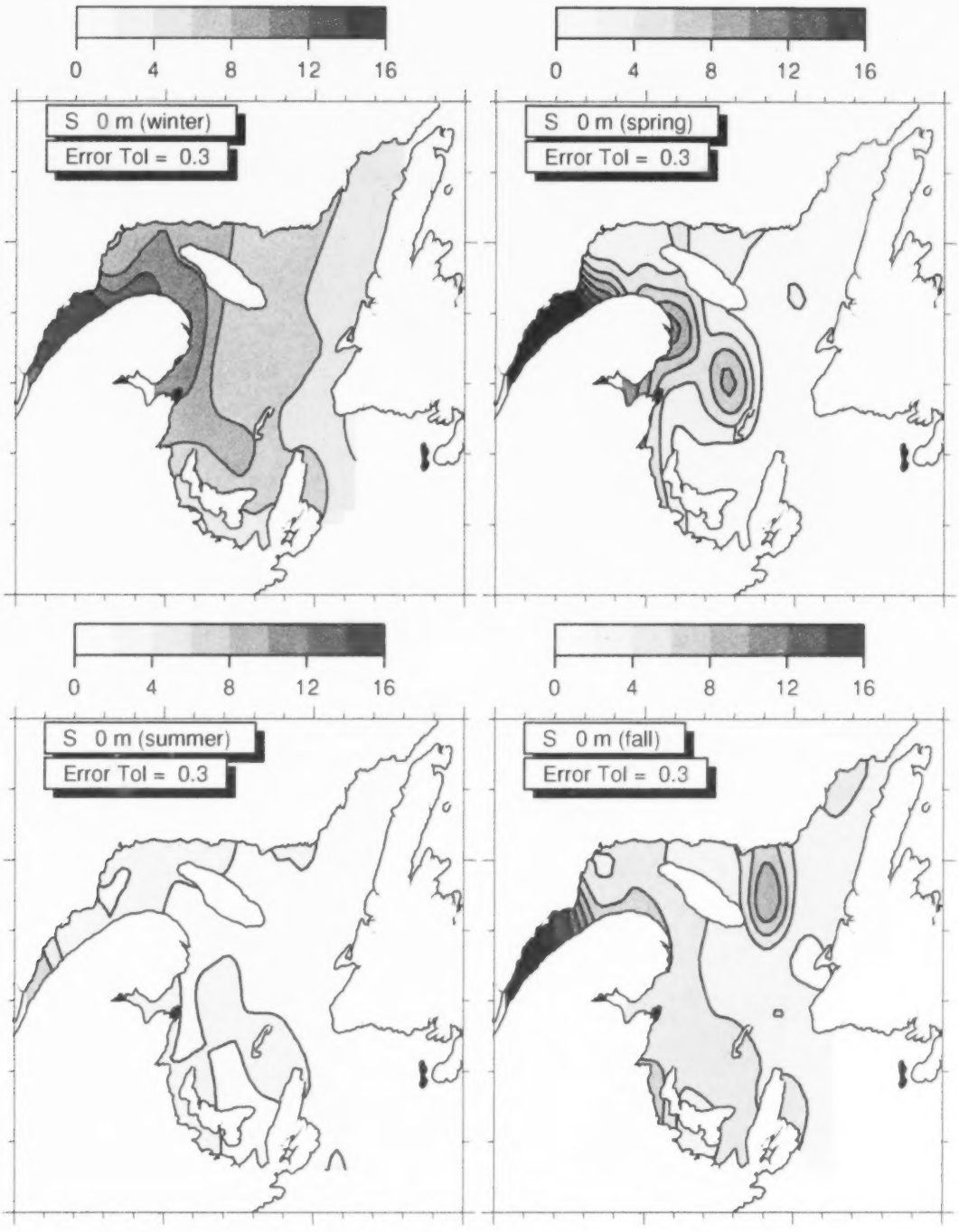
0 4 8 12 16
S 0 m (winter)
Error Tol = 0.3
0 4 8 12 16
S 0 m (spring)
Error Tol = 0.3
0 4 8 12 16
S 0 m (summer)
Error Tol = 0.3
0 4 8 12 16
S 0 m (fall)
Error Tol = 0.3

Figure 15: Seasonal optimally estimated surface silicate concentration (μM) for the Gulf of St. Lawrence.

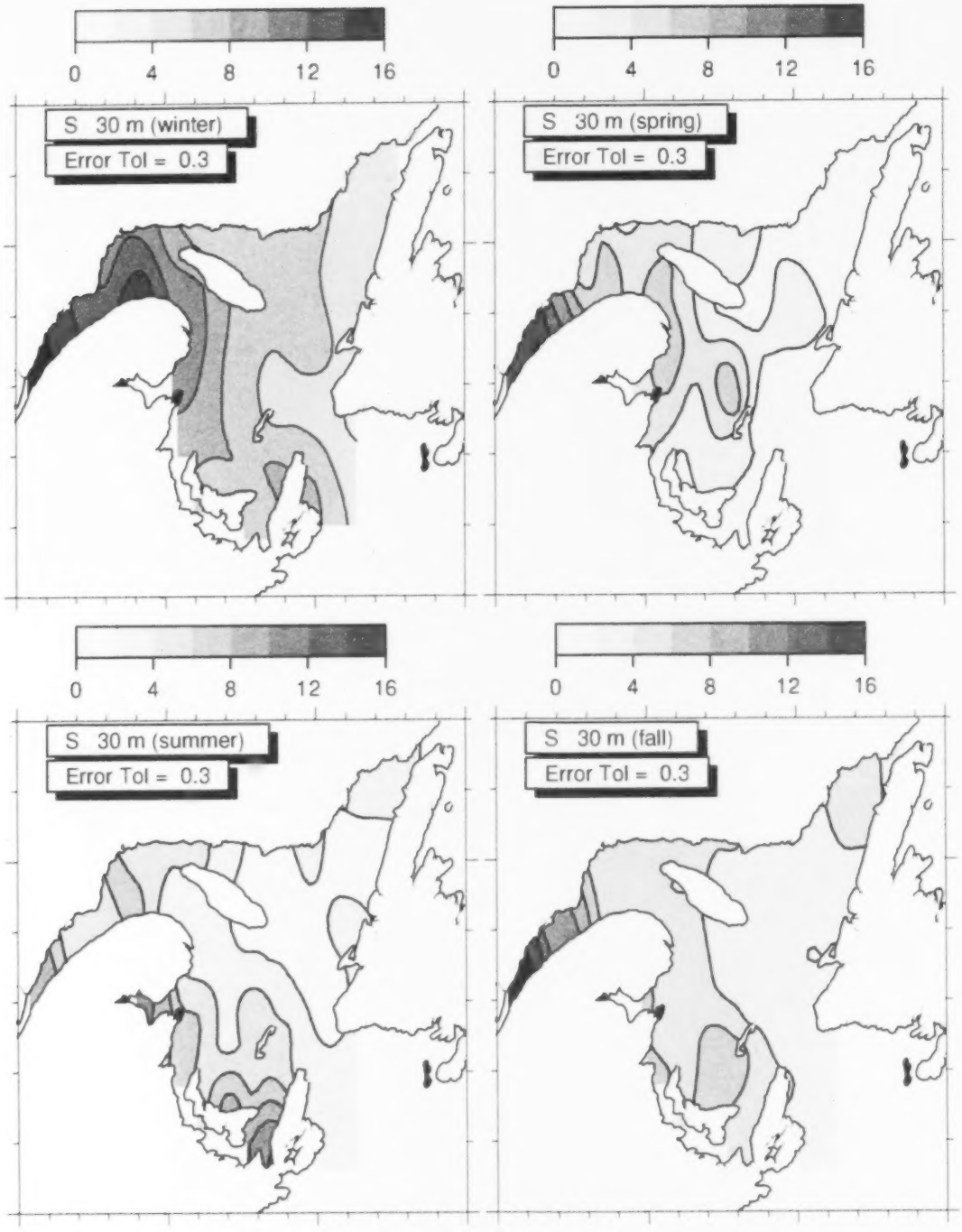

Figure 16: Seasonal optimally estimated 30m silicate concentration (μM) for the Gulf of St. Lawrence.

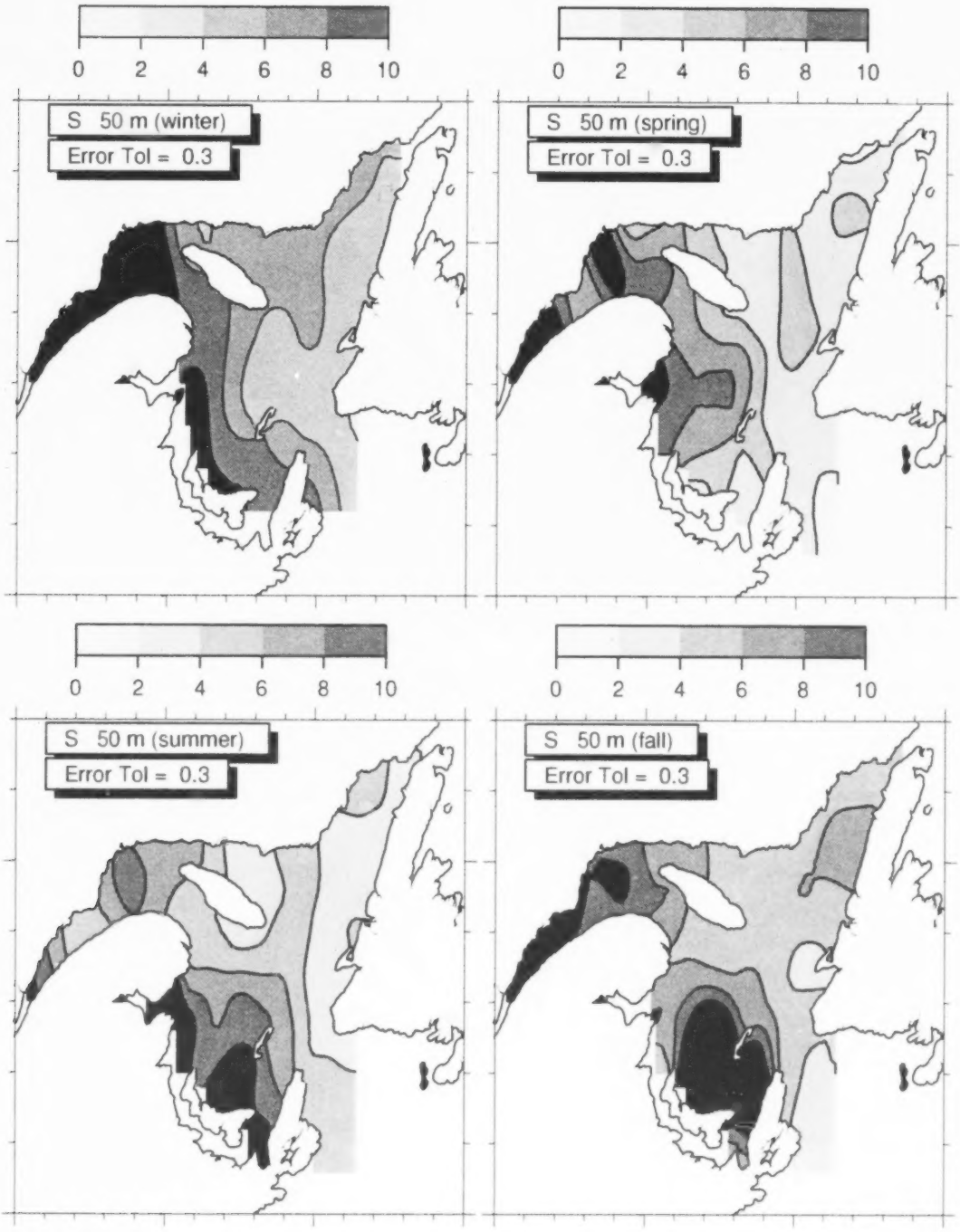
0 2 4 6 8 10
S 50 m (winter)
Error Tol = 0.3
0 2 4 6 8 10
S 50 m (spring)
Error Tol = 0.3
0 2 4 6 8 10
S 50 m (summer)
Error Tol = 0.3
0 2 4 6 8 10
S 50 m (fall)
Error Tol = 0.3

Figure 17: Seasonal optimally estimated 50m silicate concentration (μM) for the Gulf of St. Lawrence.

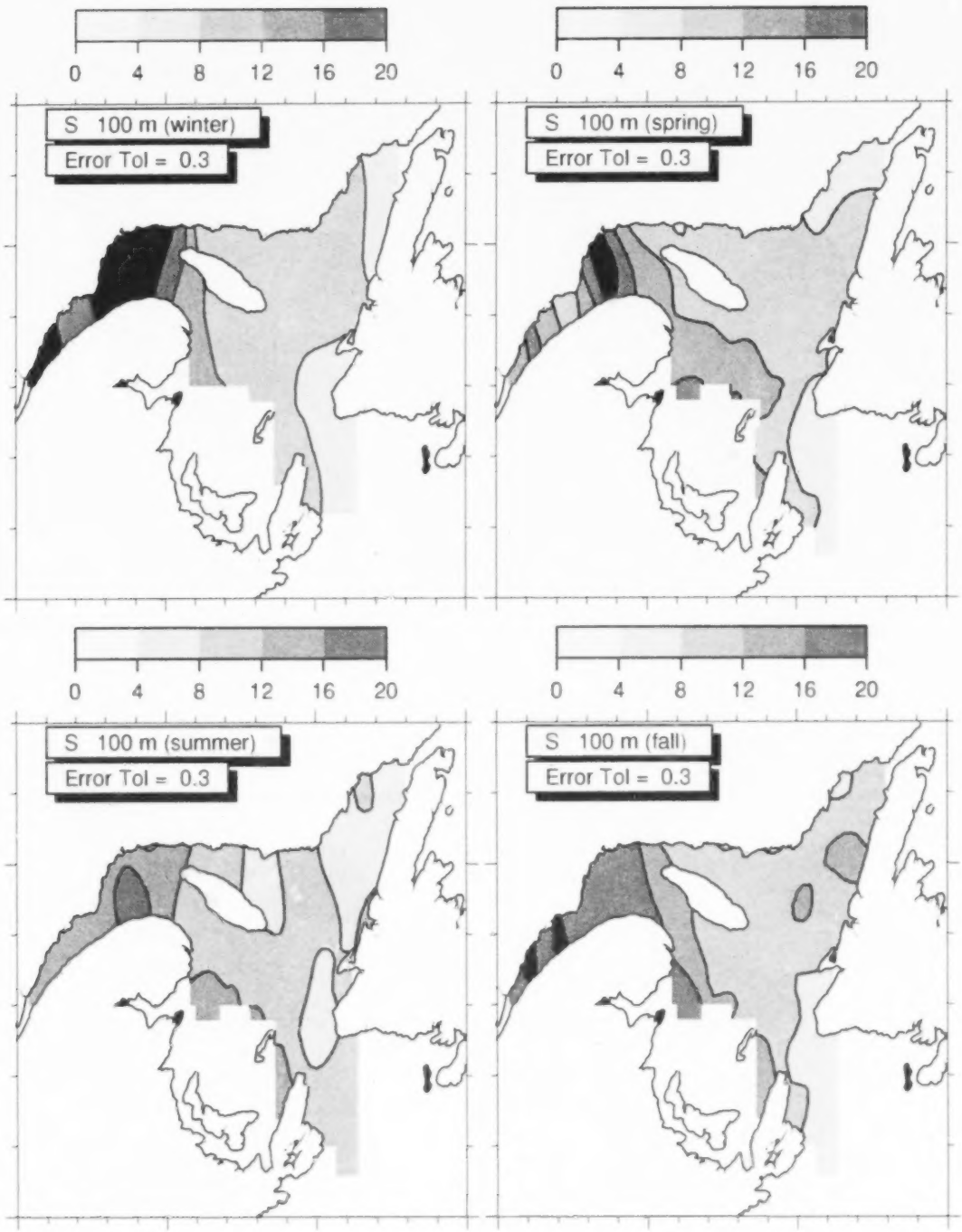
0 4 8 12 16 20
S 100 m (winter)
Error Tol = 0.3
0 4 8 12 16 20
S 100 m (spring)
Error Tol = 0.3
0 4 8 12 16 20
S 100 m (summer)
Error Tol = 0.3
0 4 8 12 16 20
S 100 m (fall)
Error Tol = 0.3

Figure 18: Seasonal optimally estimated 100m silicate concentration (μM) for the Gulf of St. Lawrence.

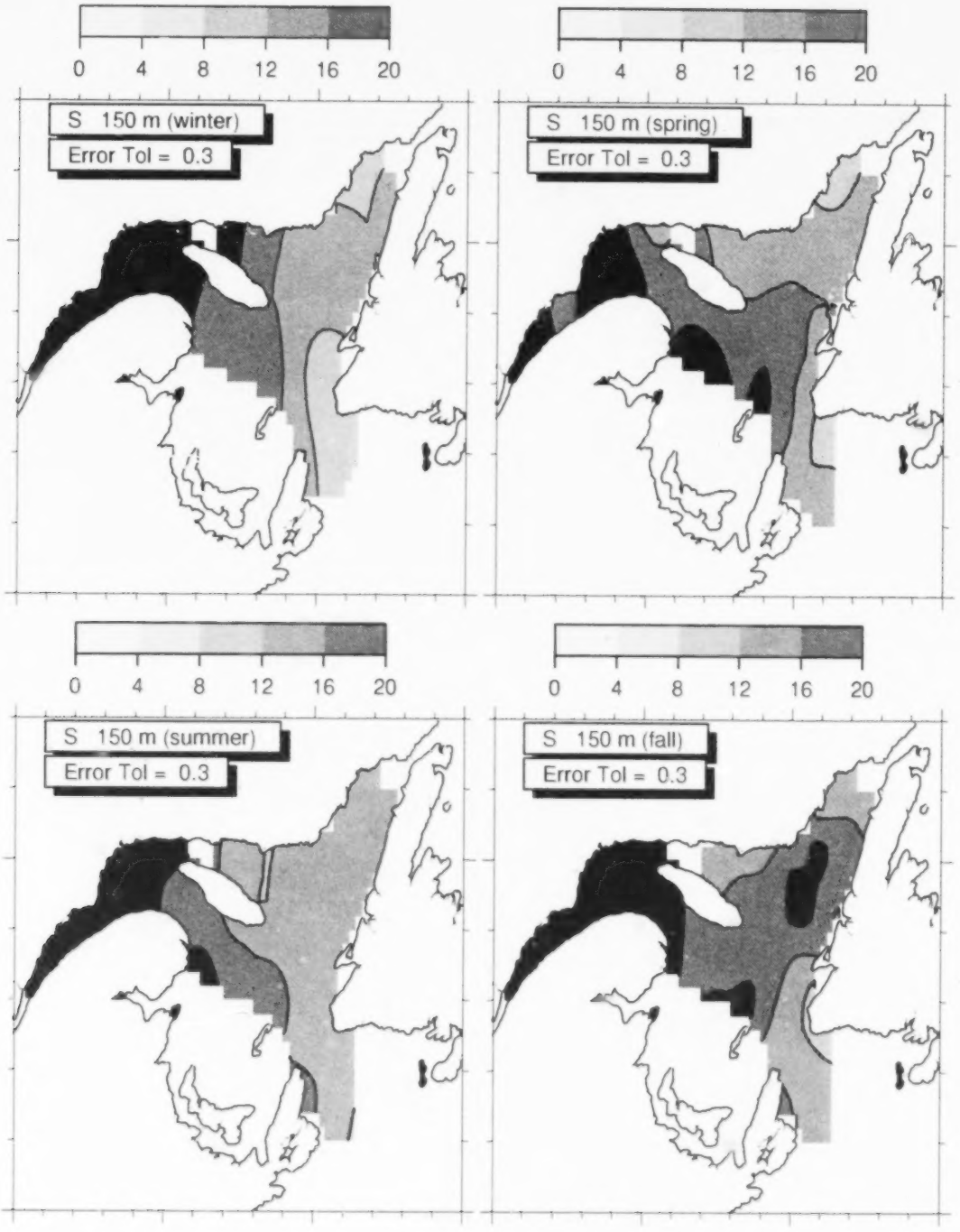
0 4 8 12 16 20
S 150 m (winter)
Error Tol = 0.3
0 4 8 12 16 20
S 150 m (spring)
Error Tol = 0.3
0 4 8 12 16 20
S 150 m (summer)
Error Tol = 0.3
0 4 8 12 16 20
S 150 m (fall)
Error Tol = 0.3

Figure 19: Seasonal optimally estimated 150m silicate concentration (μM) for the Gulf of St. Lawrence.

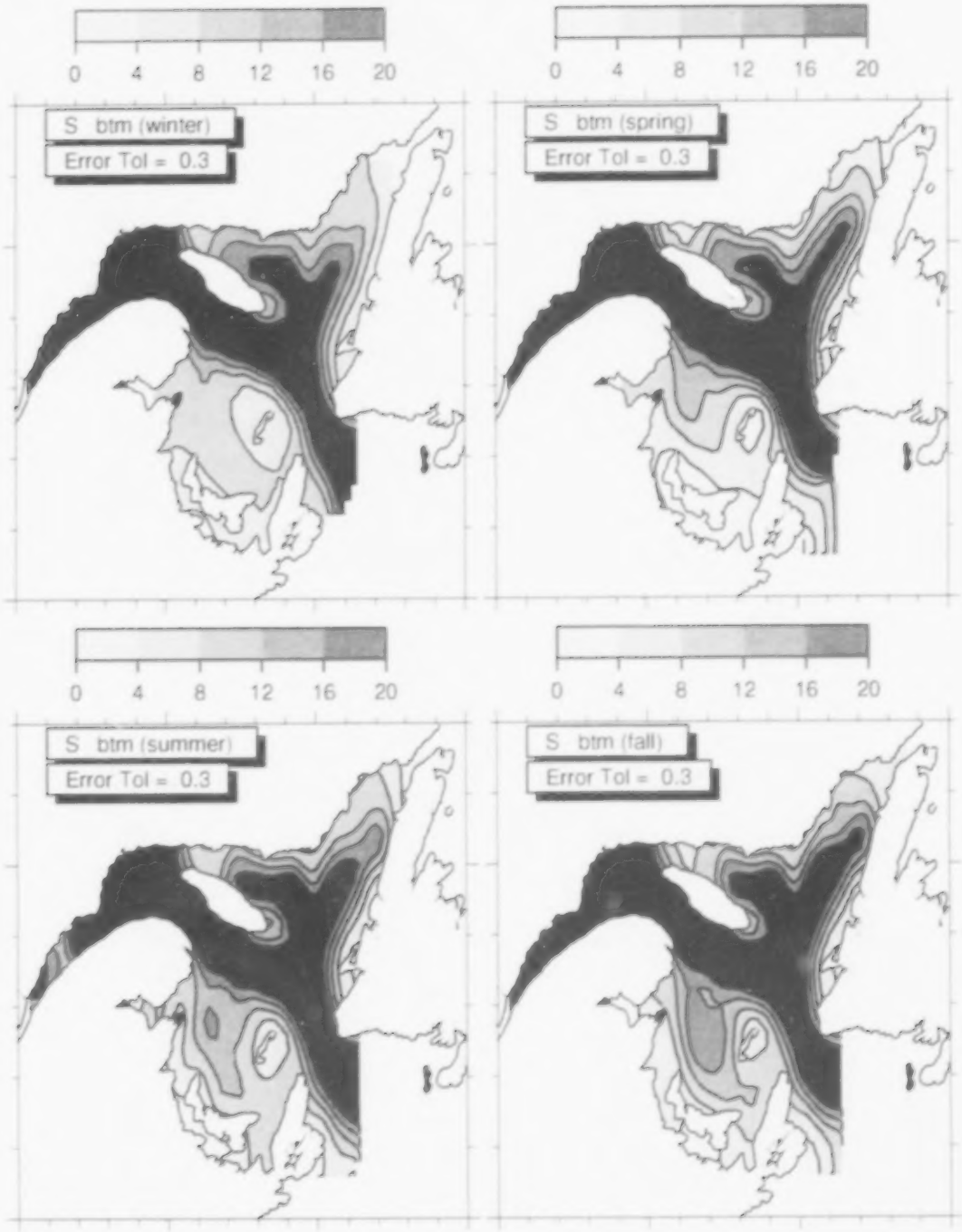
0 4 8 12 16 20
S btm (winter)
Error Tol = 0.3
0 4 8 12 16 20
S btm (spring)
Error Tol = 0.3
0 4 8 12 16 20
S btm (summer)
Error Tol = 0.3
0 4 8 12 16 20
S btm (fall)
Error Tol = 0.3

Figure 20: Seasonal optimally estimated bottom silicate concentration (μM) for the Gulf of St. Lawrence.

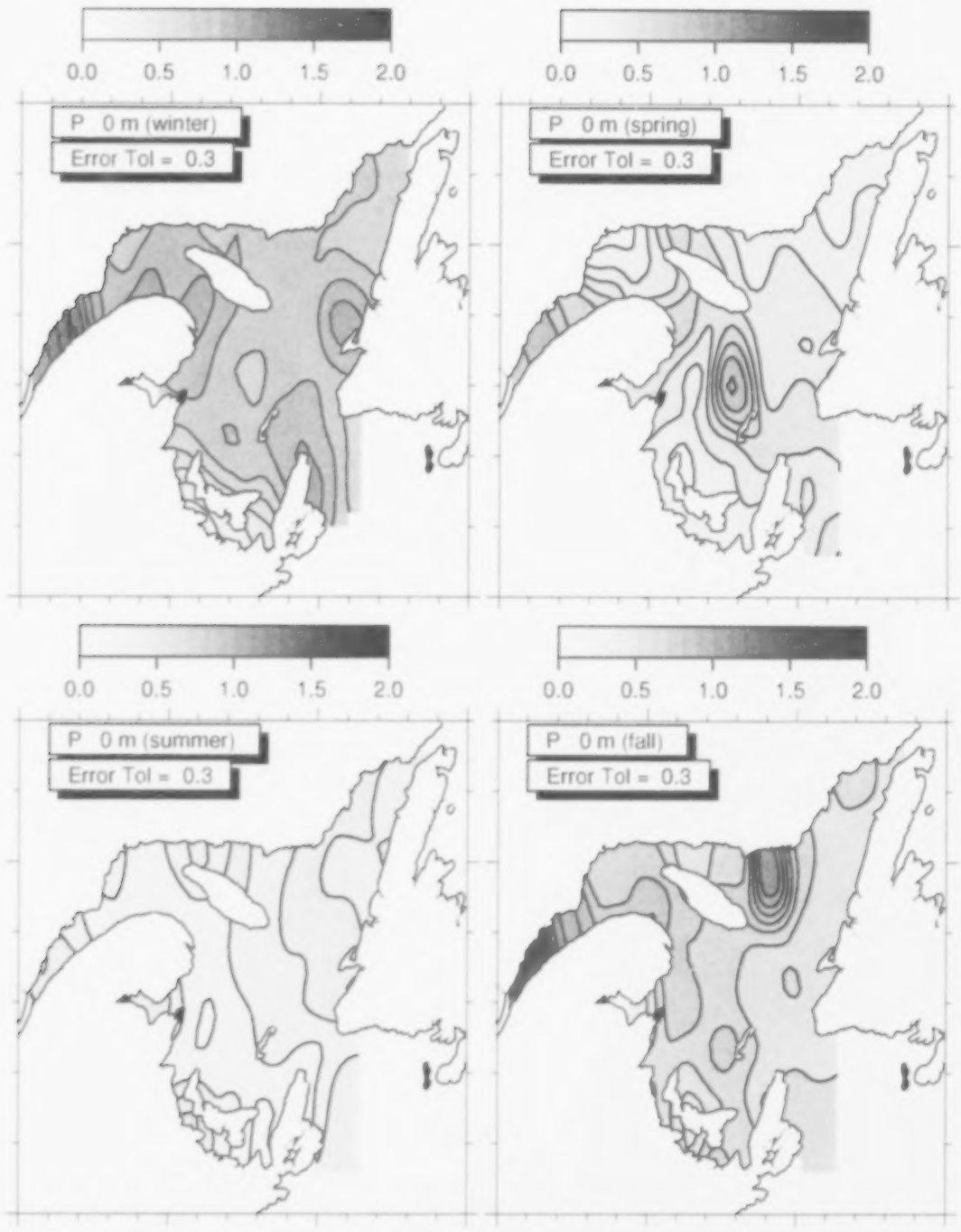
0.0 0.5 1.0 1.5 2.0
P 0 m (winter)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 0 m (spring)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 0 m (summer)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 0 m (fall)
Error Tol = 0.3

Figure 21: Seasonal optimally estimated surface phosphate concentration (μM) for the Gulf of St. Lawrence.

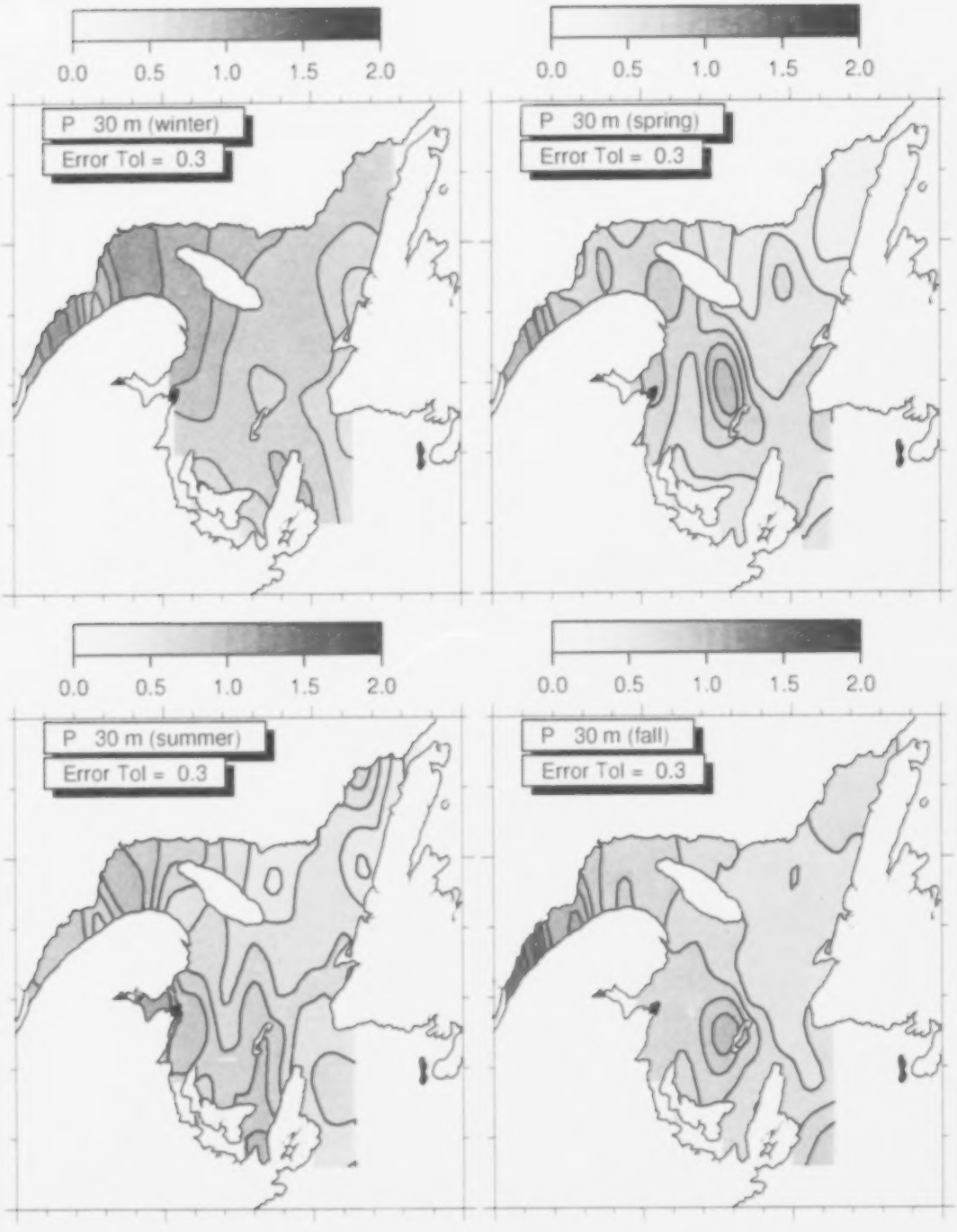
0.0 0.5 1.0 1.5 2.0
P 30 m (winter)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 30 m (spring)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 30 m (summer)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 30 m (fall)
Error Tol = 0.3

Figure 22: Seasonal optimally estimated 30m phosphate concentration (μM) for the Gulf of St. Lawrence.

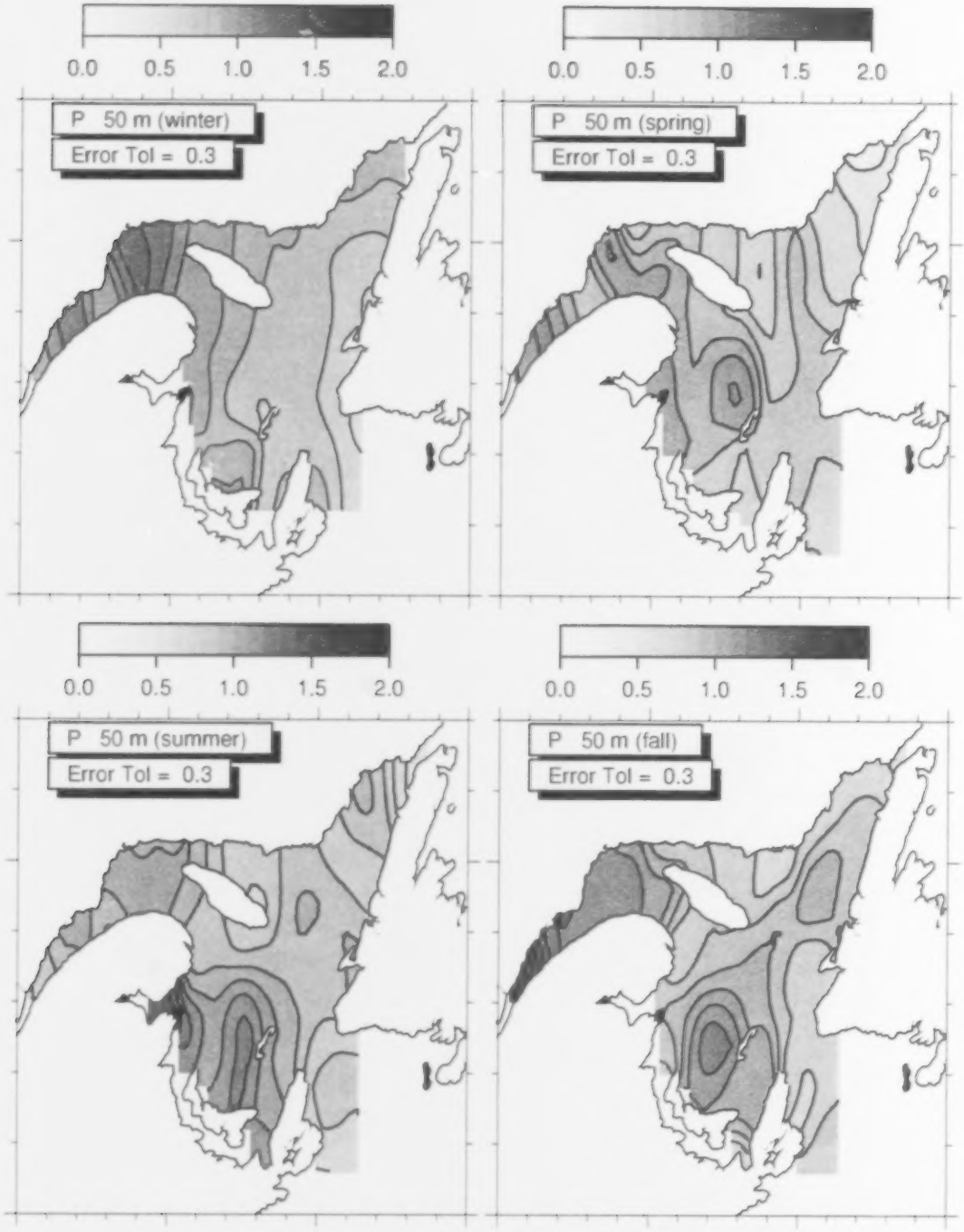
0.0 0.5 1.0 1.5 2.0
P 50 m (winter)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 50 m (spring)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 50 m (summer)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 50 m (fall)
Error Tol = 0.3

Figure 23: Seasonal optimally estimated 50m phosphate concentration (μM) for the Gulf of St. Lawrence.

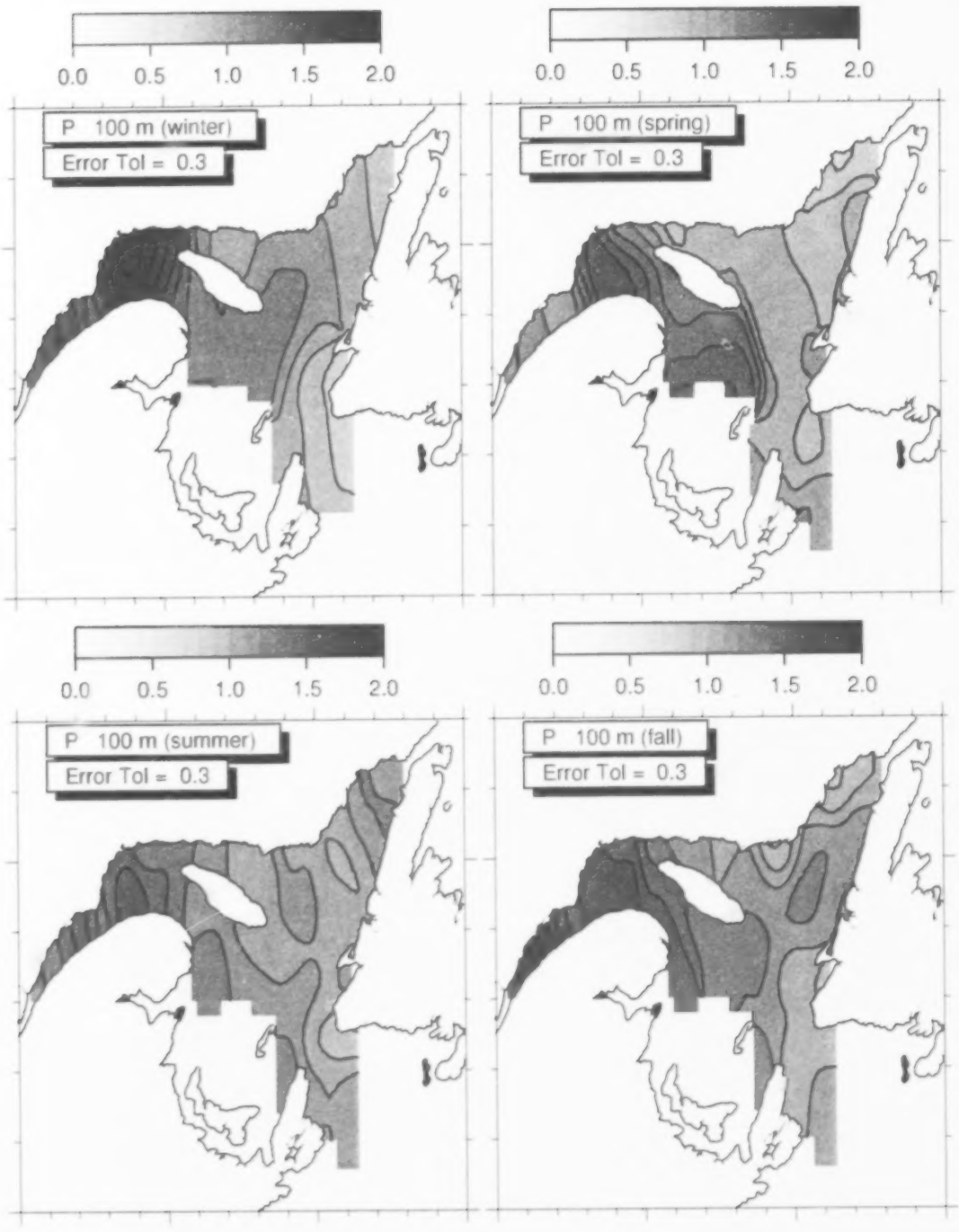
0.0 0.5 1.0 1.5 2.0
P 100 m (winter)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 100 m (spring)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 100 m (summer)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 100 m (fall)
Error Tol = 0.3

Figure 24: Seasonal optimally estimated 100m phosphate concentration (μM) for the Gulf of St. Lawrence.

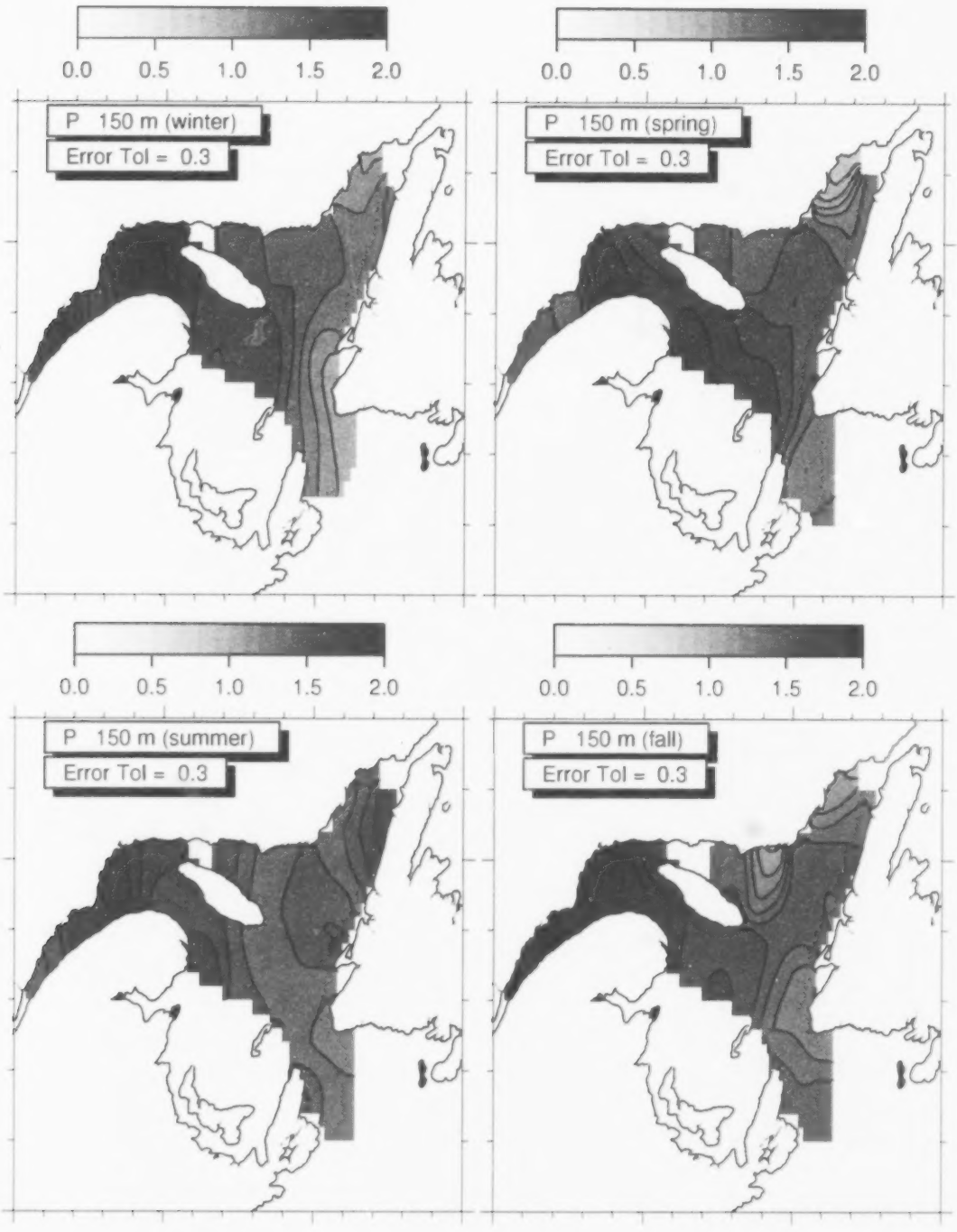
0.0 0.5 1.0 1.5 2.0
P 150 m (winter)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 150 m (spring)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 150 m (summer)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P 150 m (fall)
Error Tol = 0.3

Figure 25: Seasonal optimally estimated 150m phosphate concentration (μM) for the Gulf of St. Lawrence.

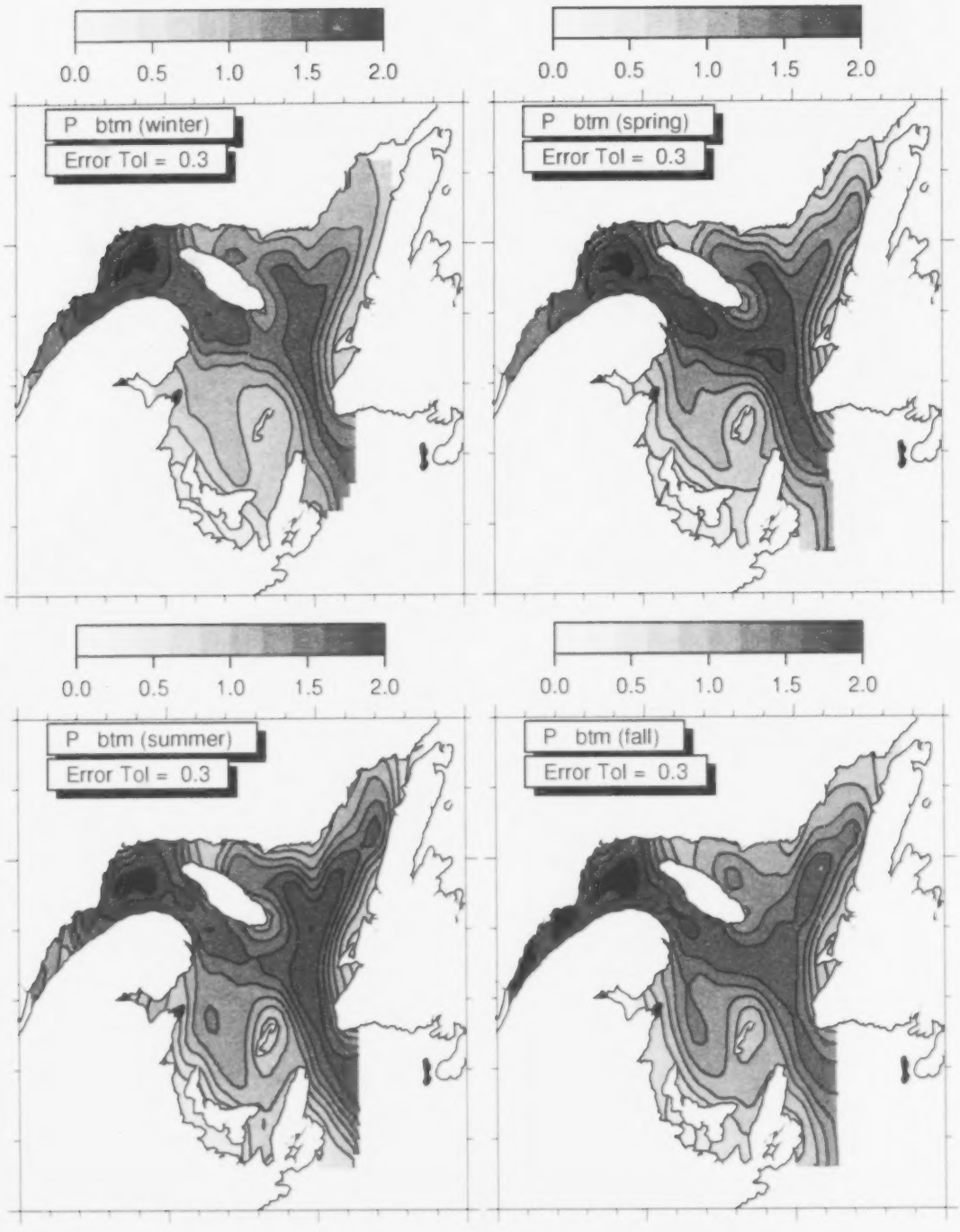
0.0 0.5 1.0 1.5 2.0
P btm (winter)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P btm (spring)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P btm (summer)
Error Tol = 0.3
0.0 0.5 1.0 1.5 2.0
P btm (fall)
Error Tol = 0.3

Figure 26: Seasonal optimally estimated bottom phosphate concentration (μM) for the Gulf of St. Lawrence.

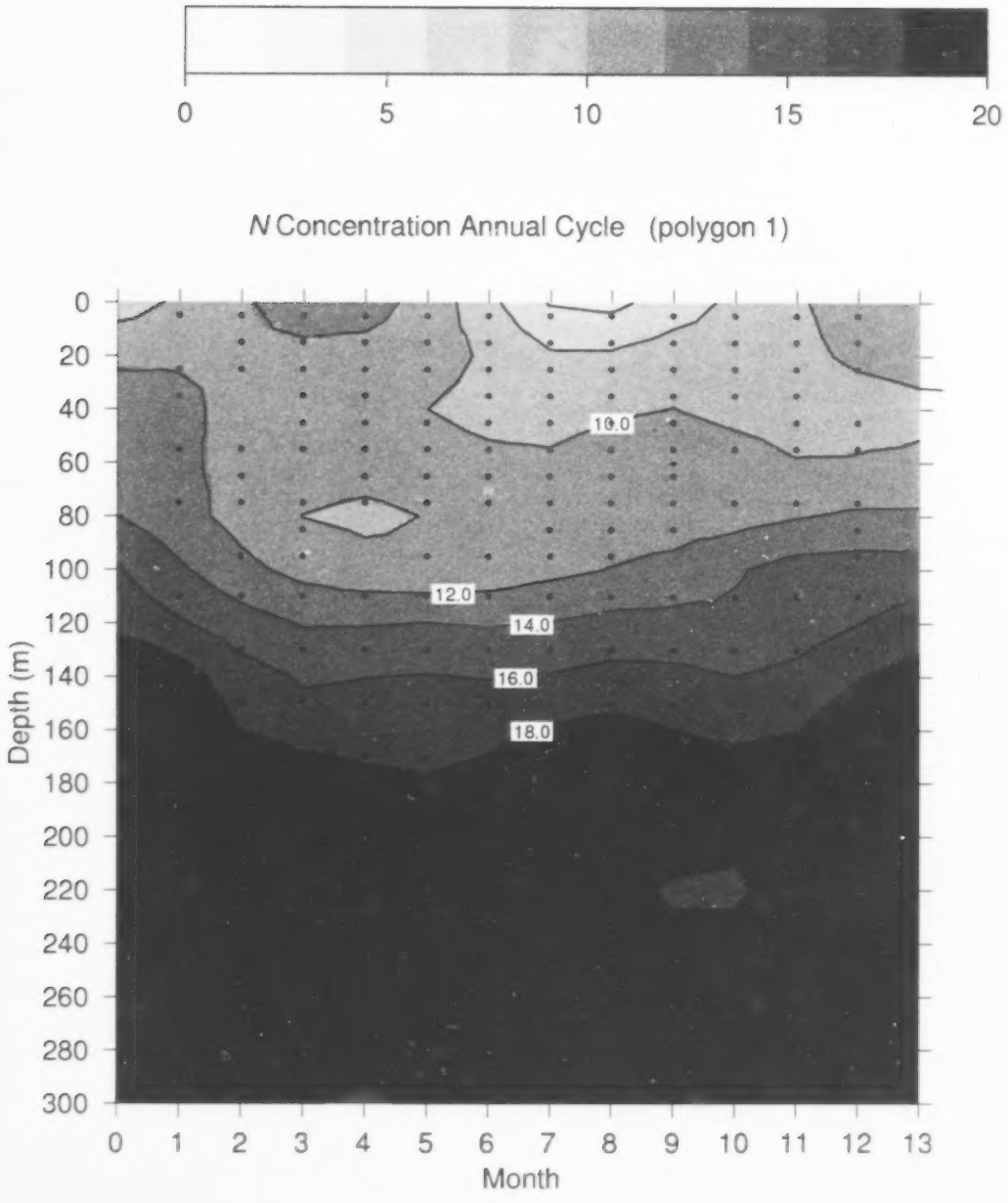

Figure 27: Annual cycle of average nitrate concentration (μM) for polygon 1. For this and subsequent contour plots, the dots represent points where data exist.

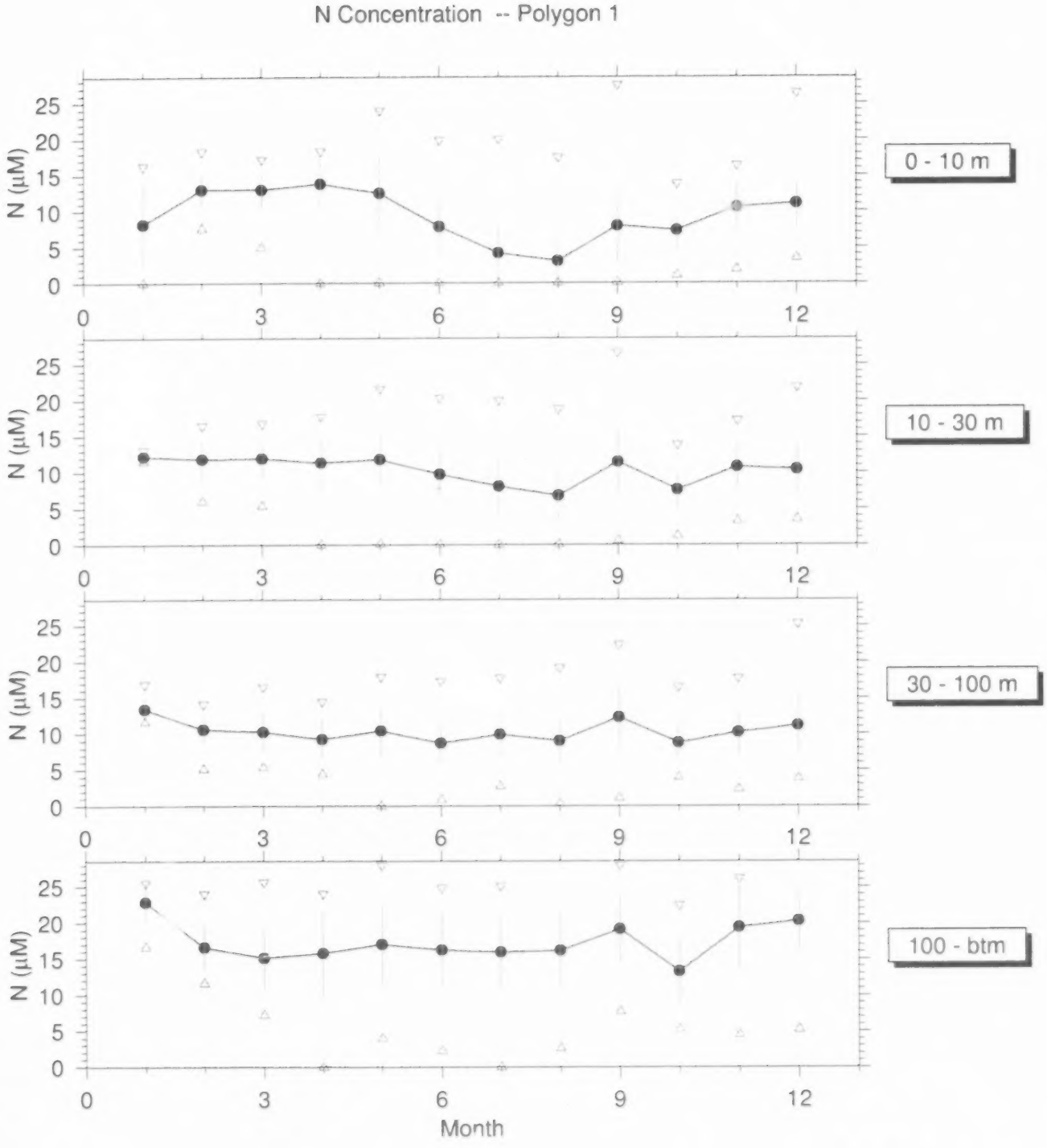

Figure 28: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 1. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

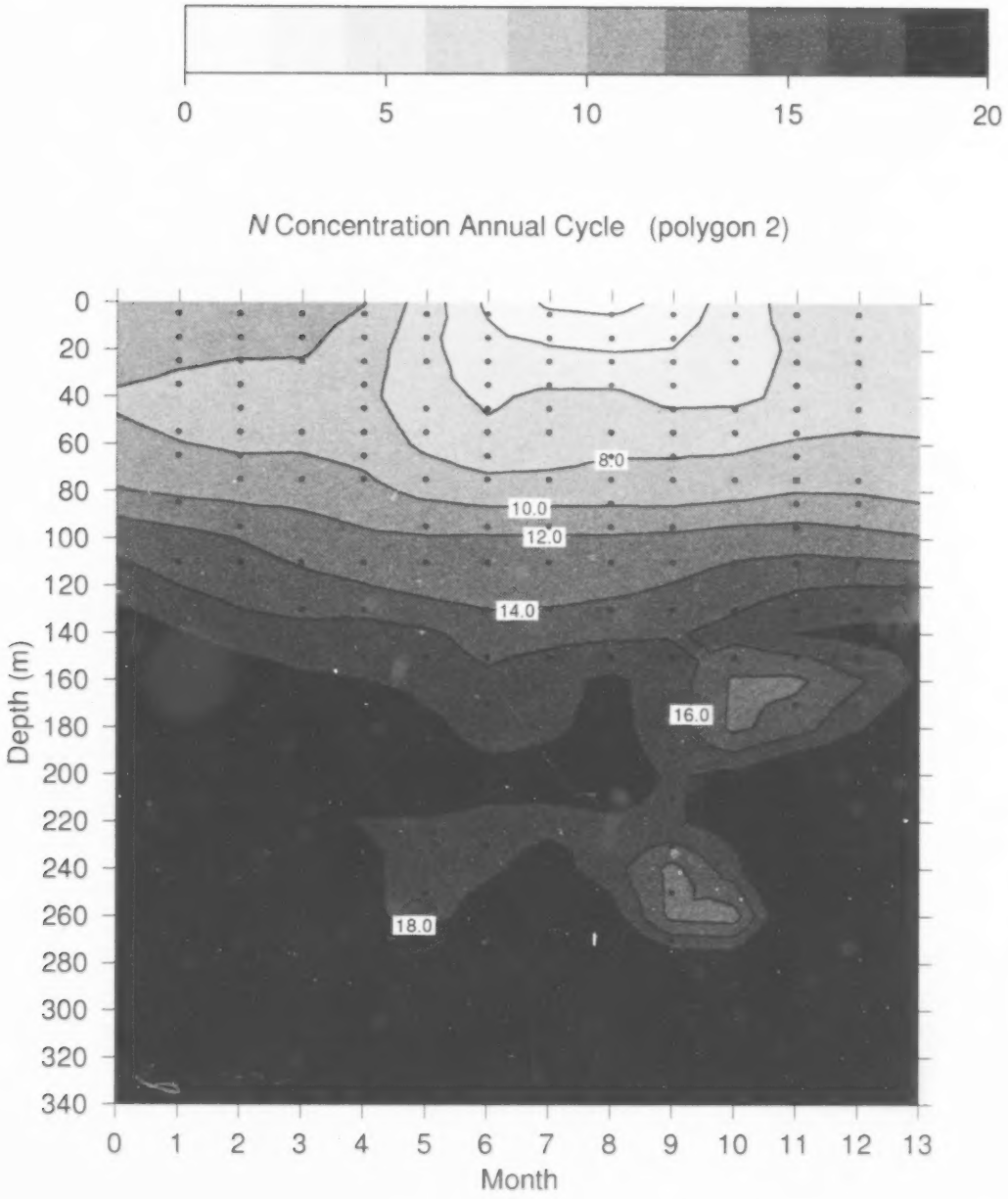

Figure 29: Annual cycle of average nitrate concentration (μM) for polygon 2.

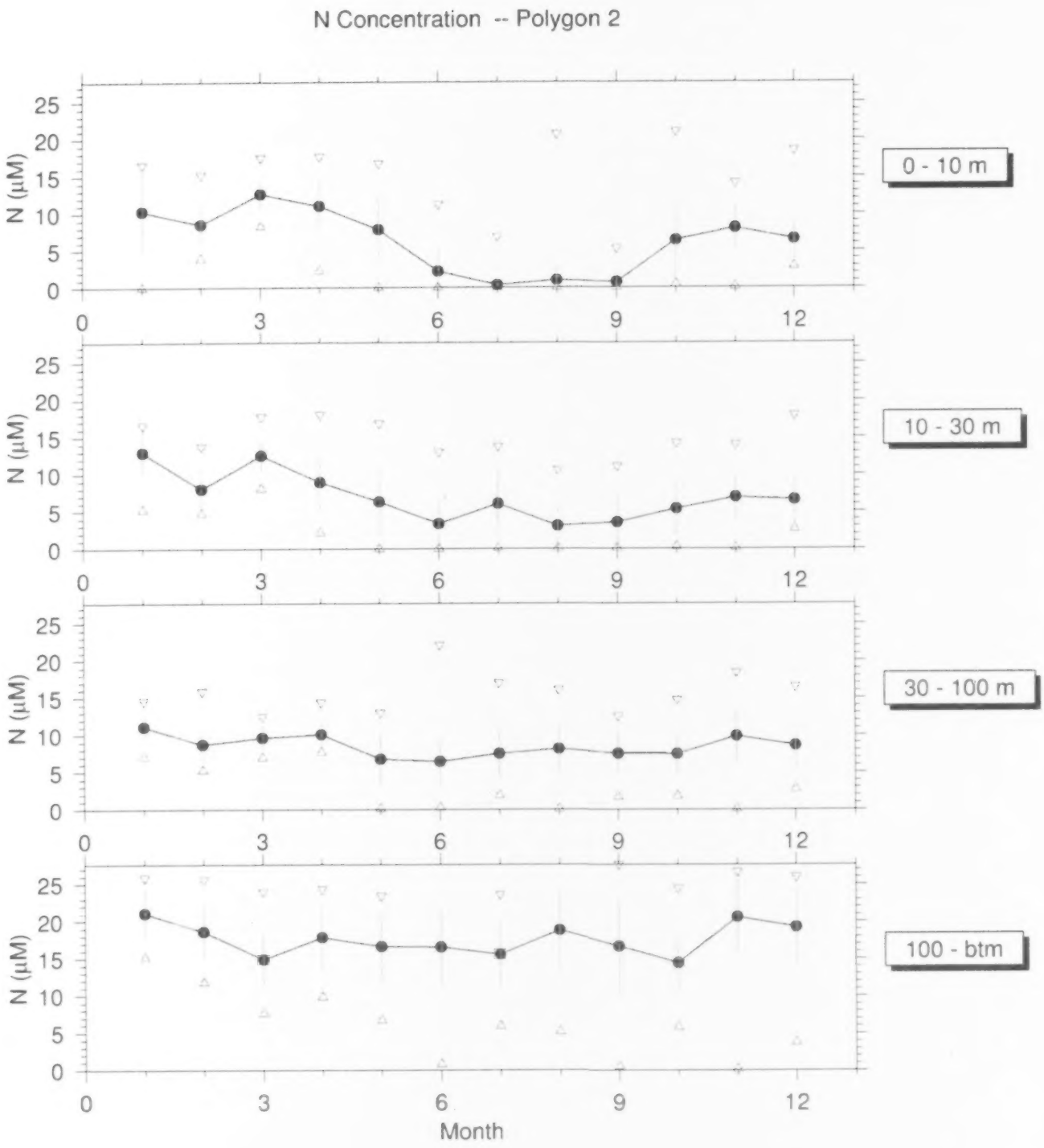

Figure 30: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 2. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

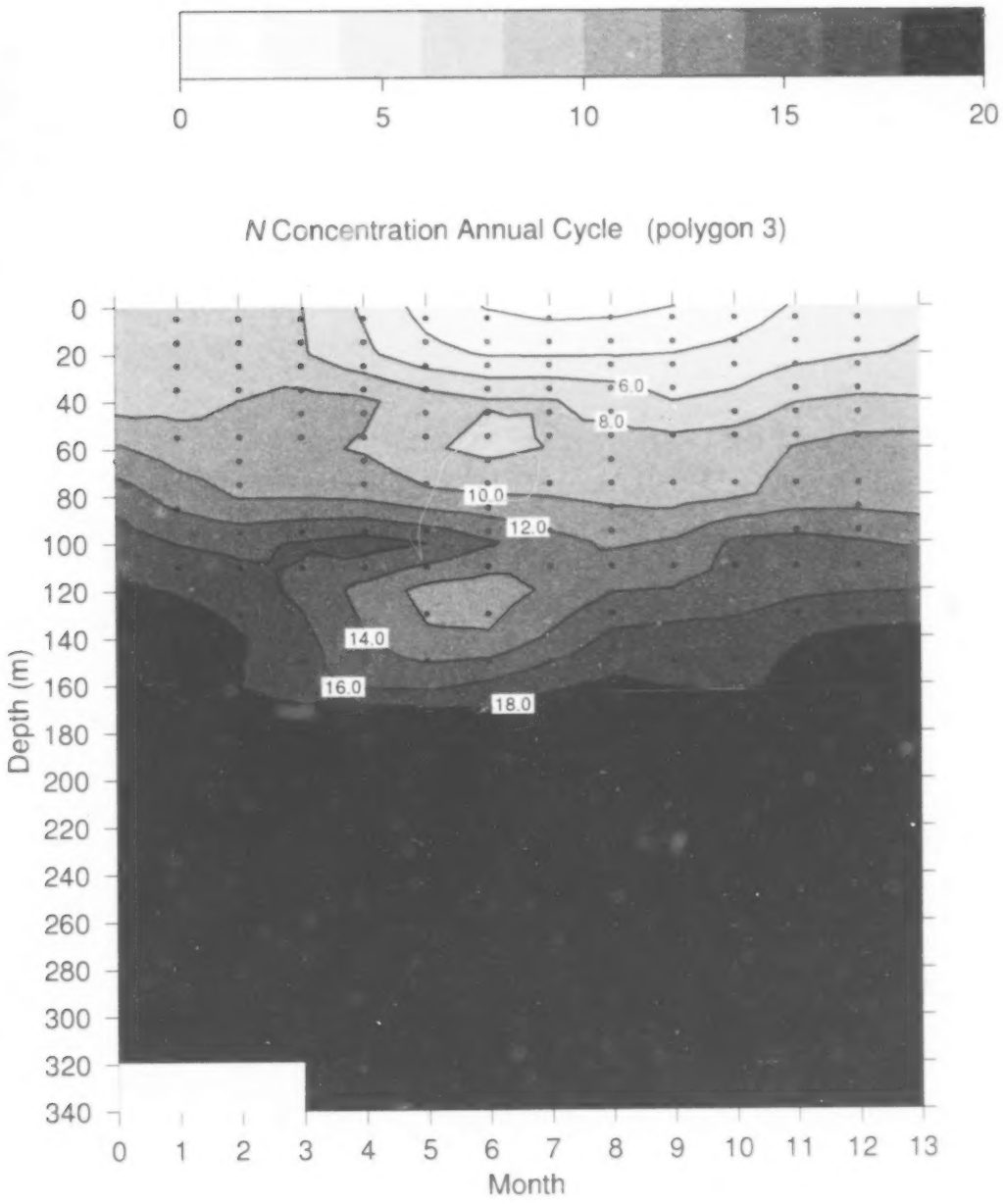

Figure 31: Annual cycle of average nitrate concentration (μM) for polygon 3.

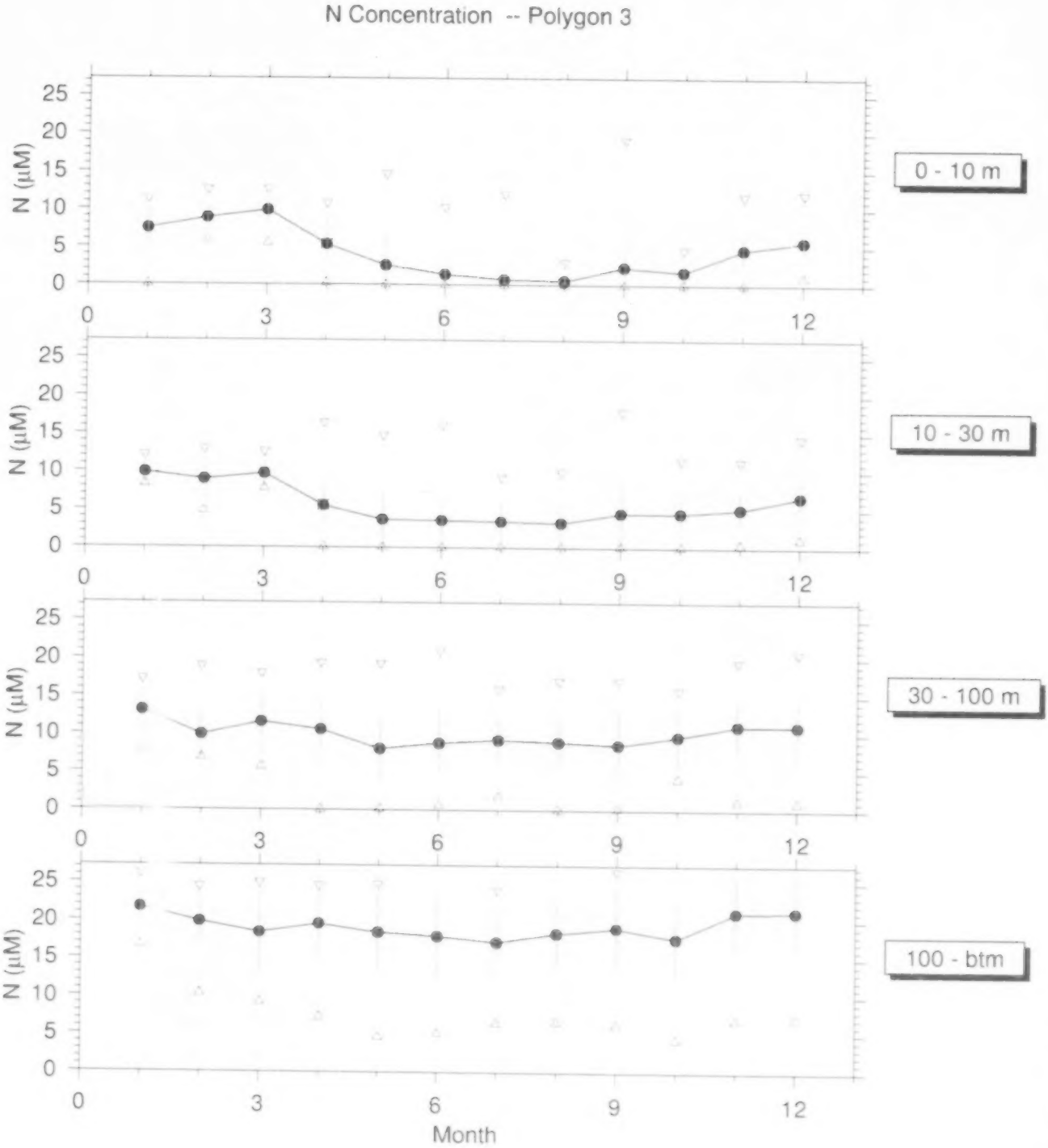

Figure 32: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 3. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

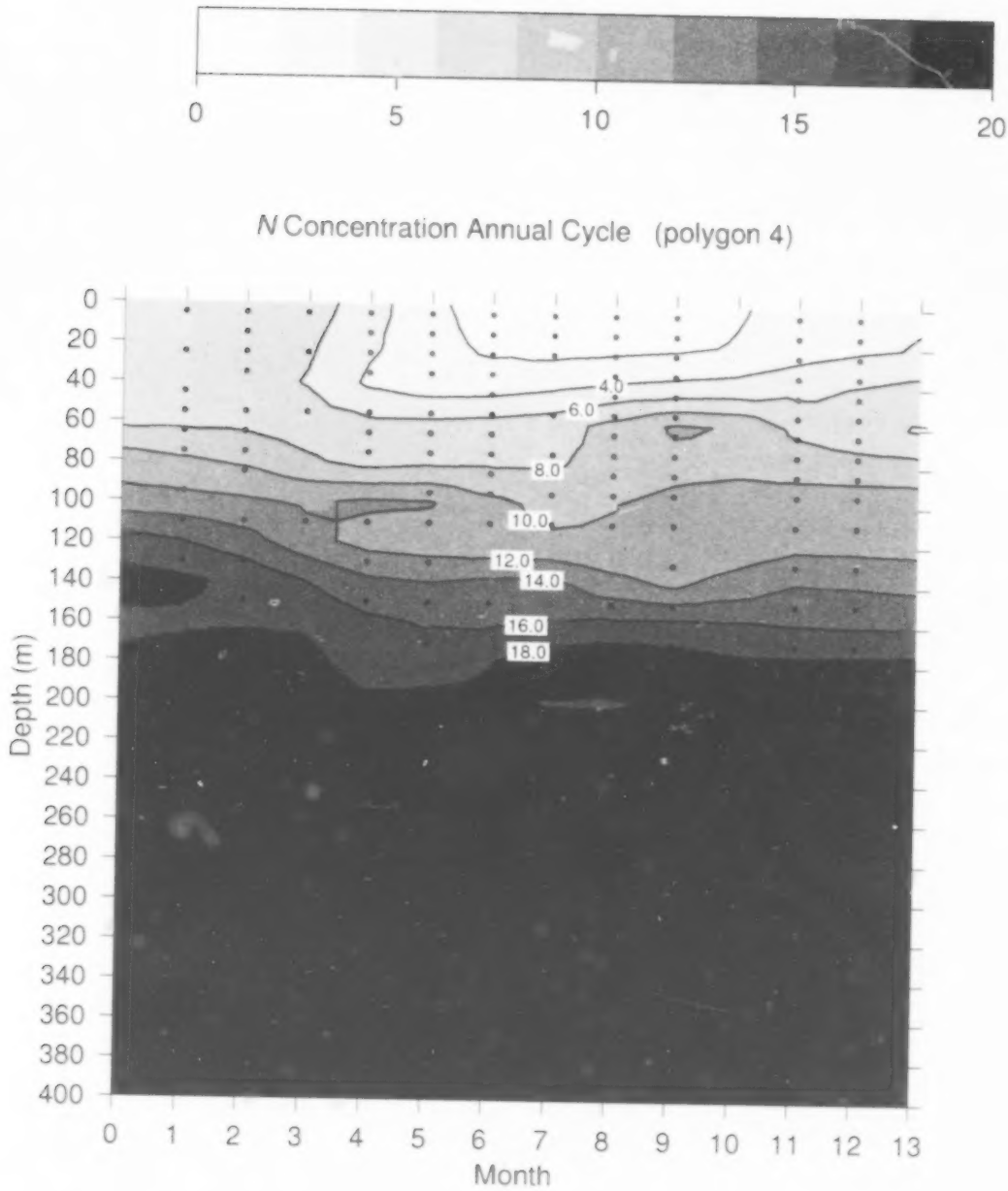

Figure 33: Annual cycle of average nitrate concentration (μM) for polygon 4.

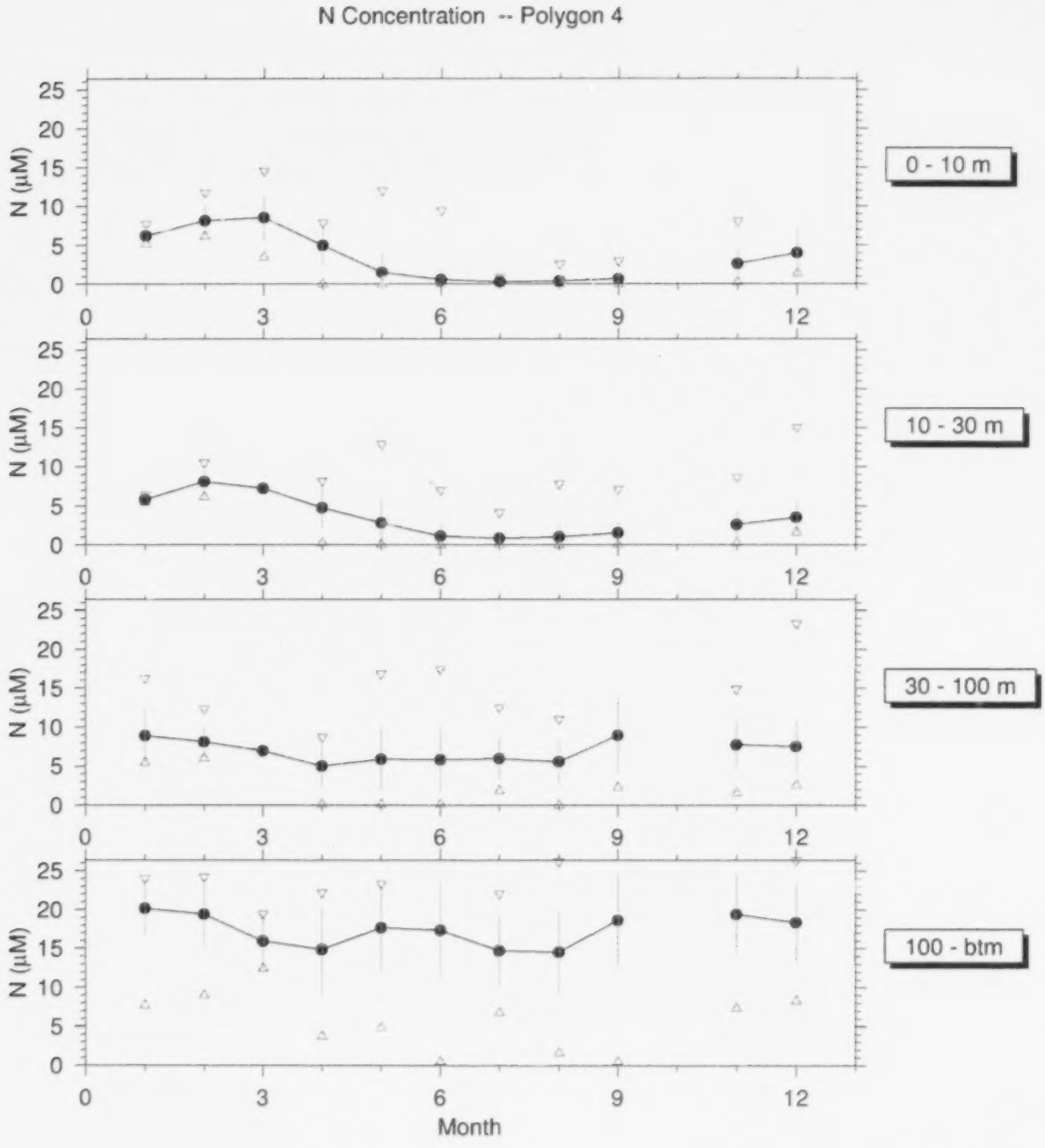

Figure 34: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 4. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

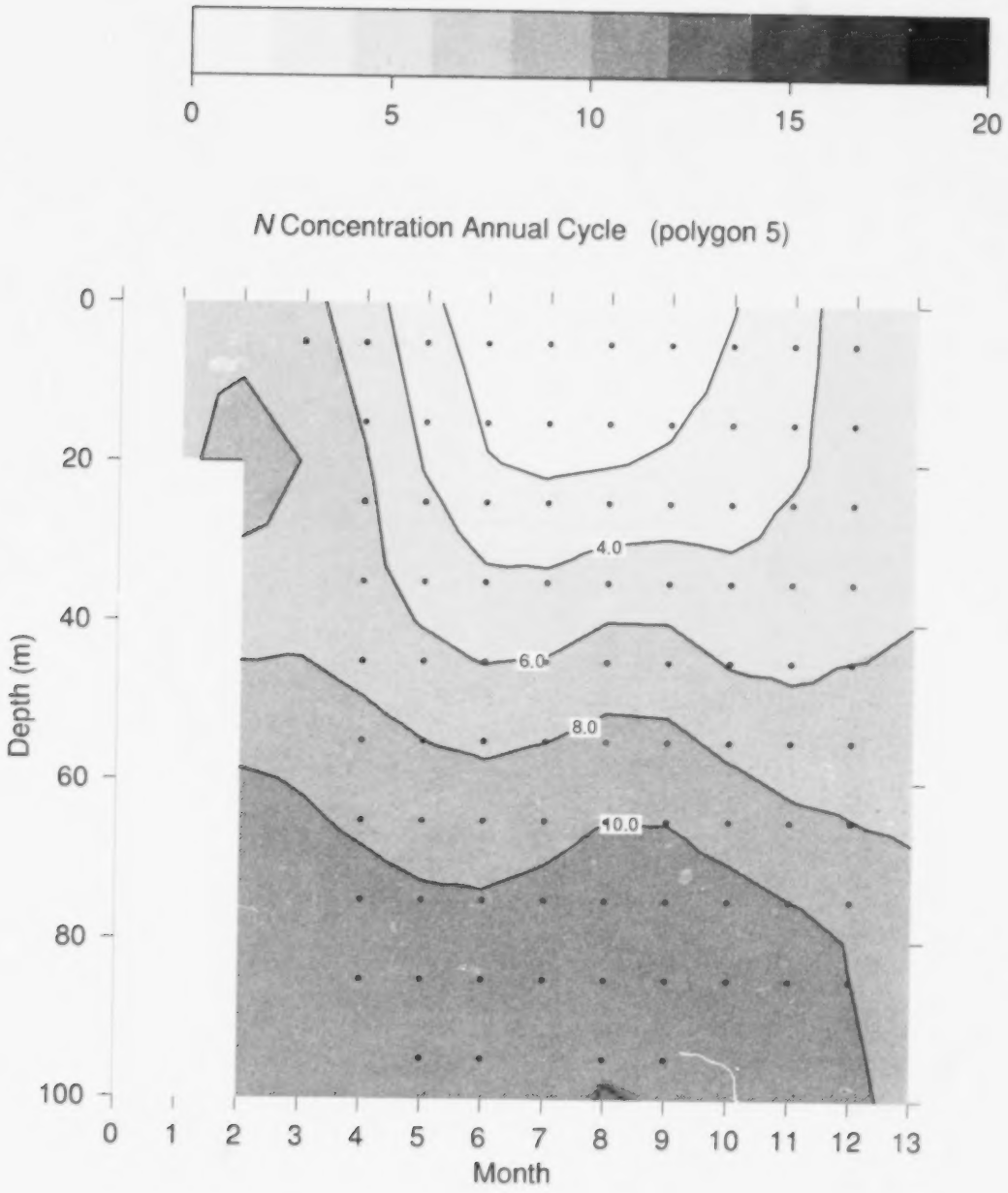

Figure 35: Annual cycle of average nitrate concentration (μM) for polygon 5.

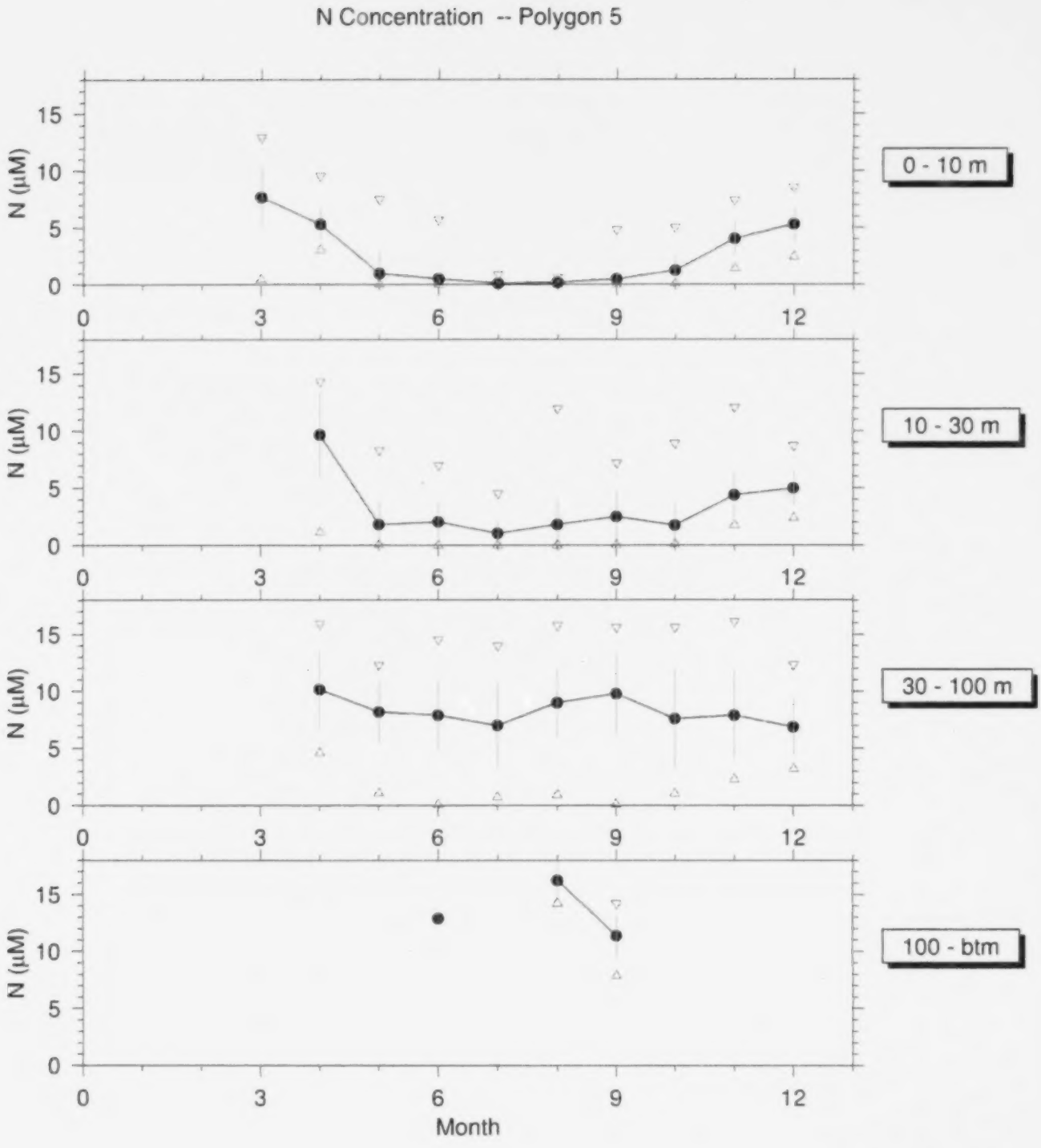

Figure 36: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 5. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

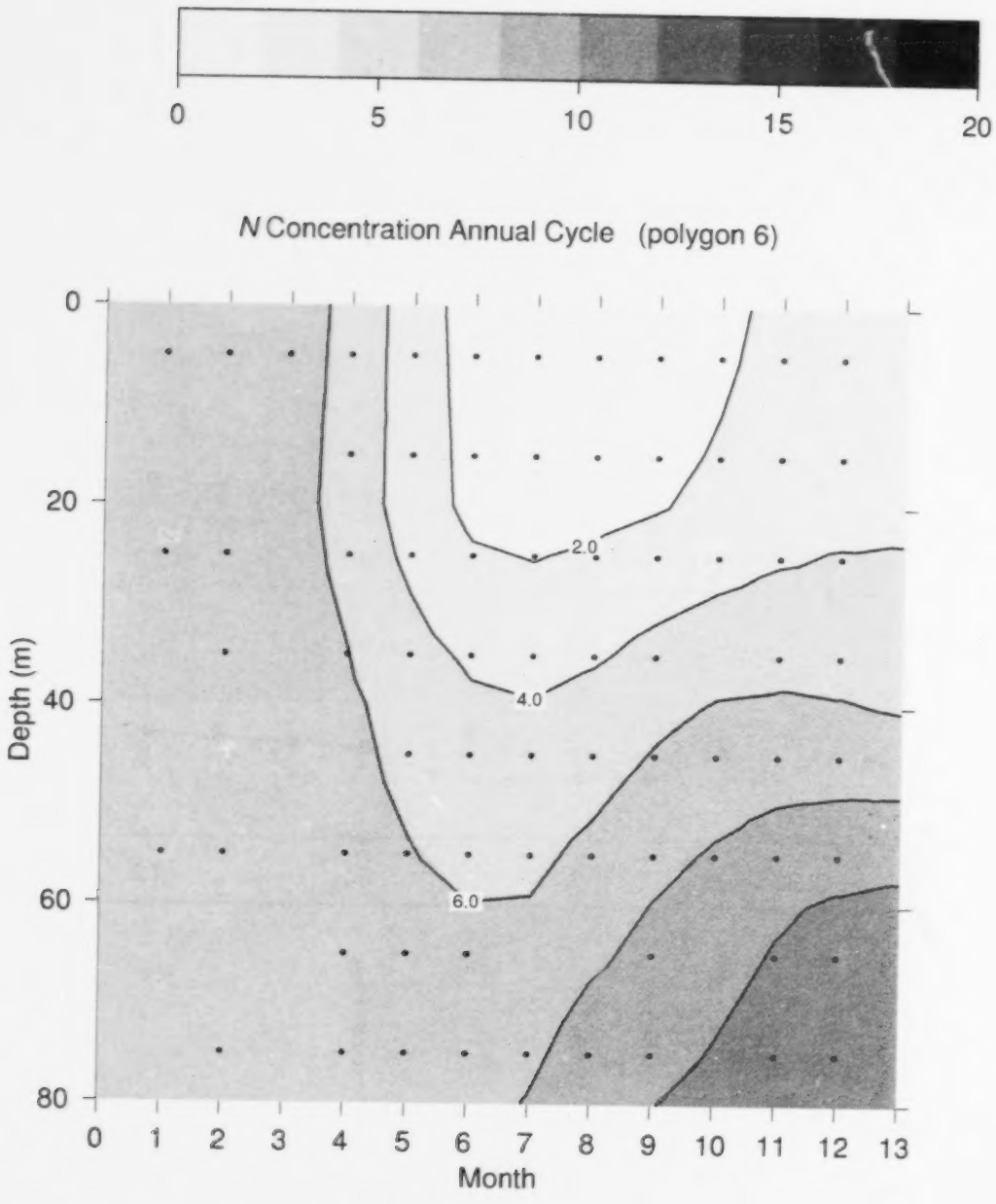

Figure 37: Annual cycle of average nitrate concentration (μM) for polygon 6.

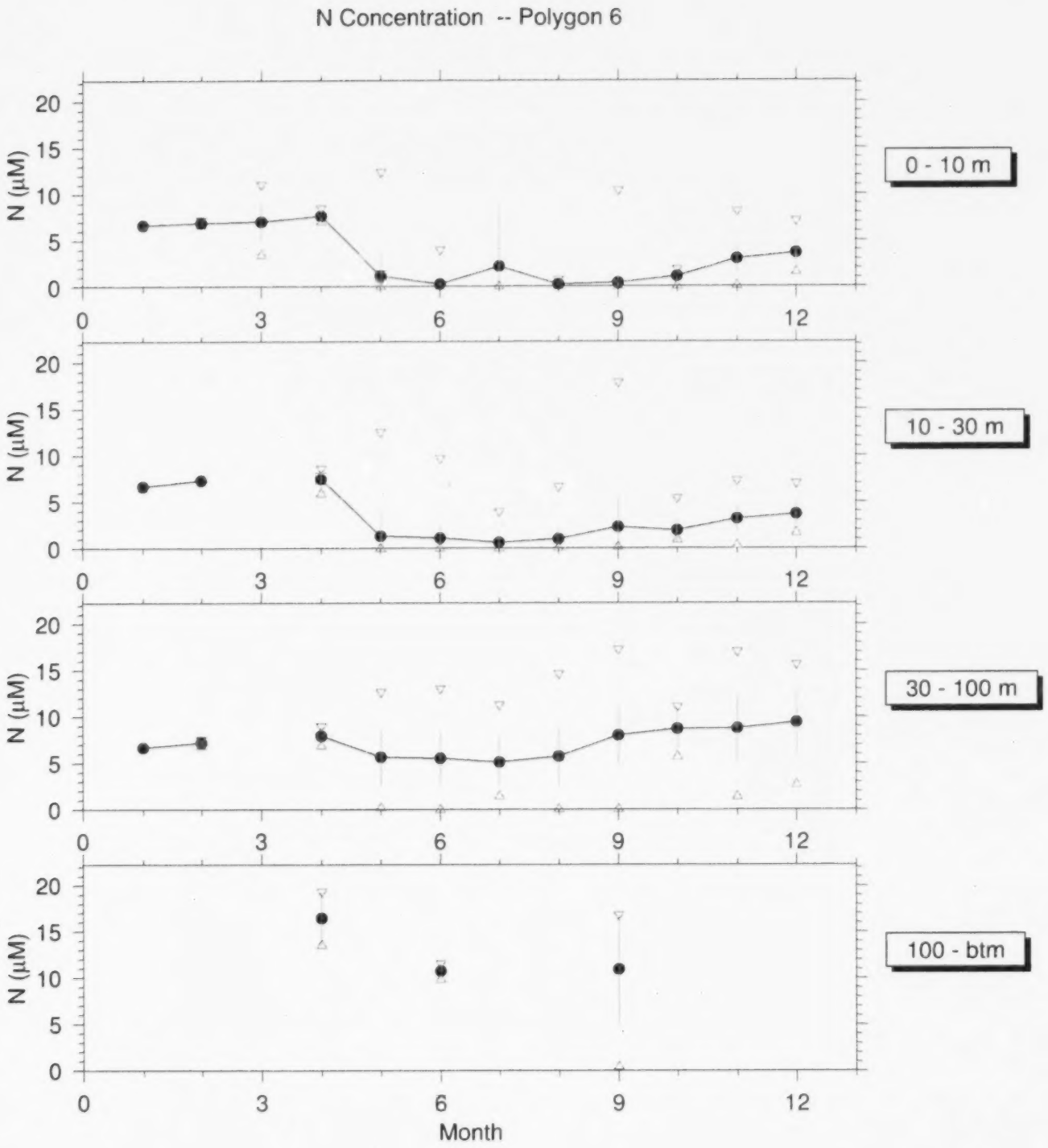

Figure 38: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 6. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

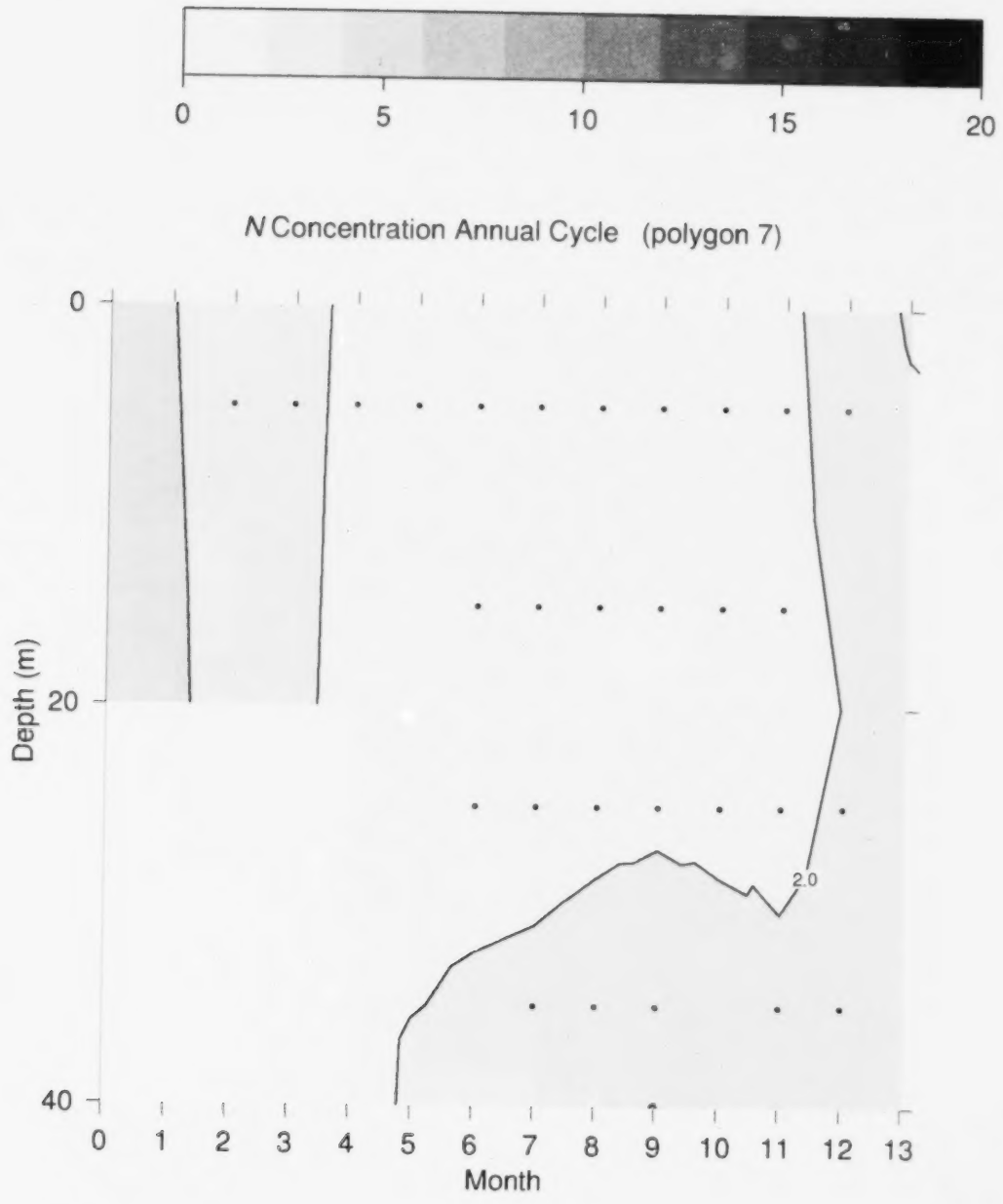

Figure 39: Annual cycle of average nitrate concentration (μM) for polygon 7.

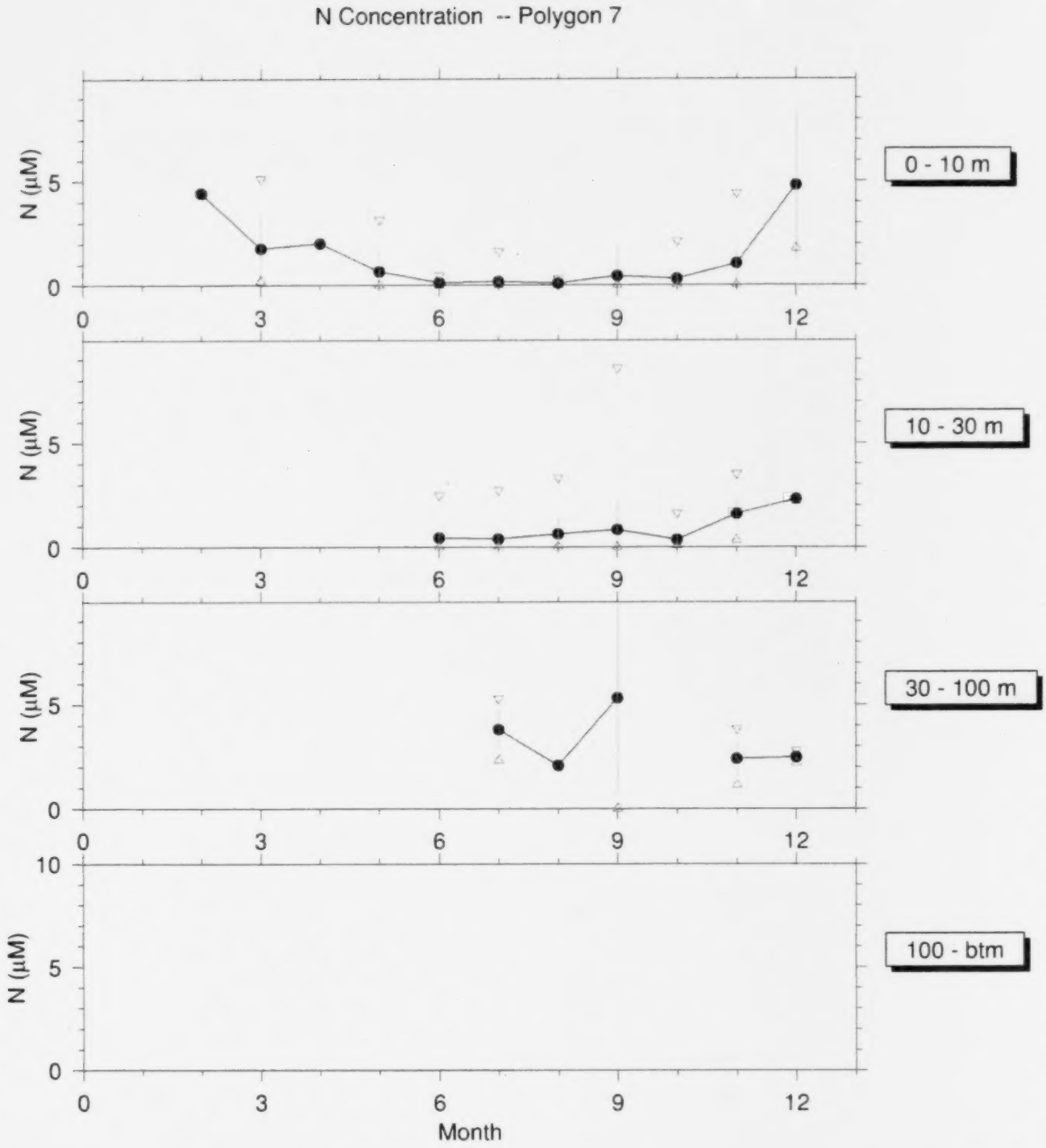

Figure 40: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 7. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

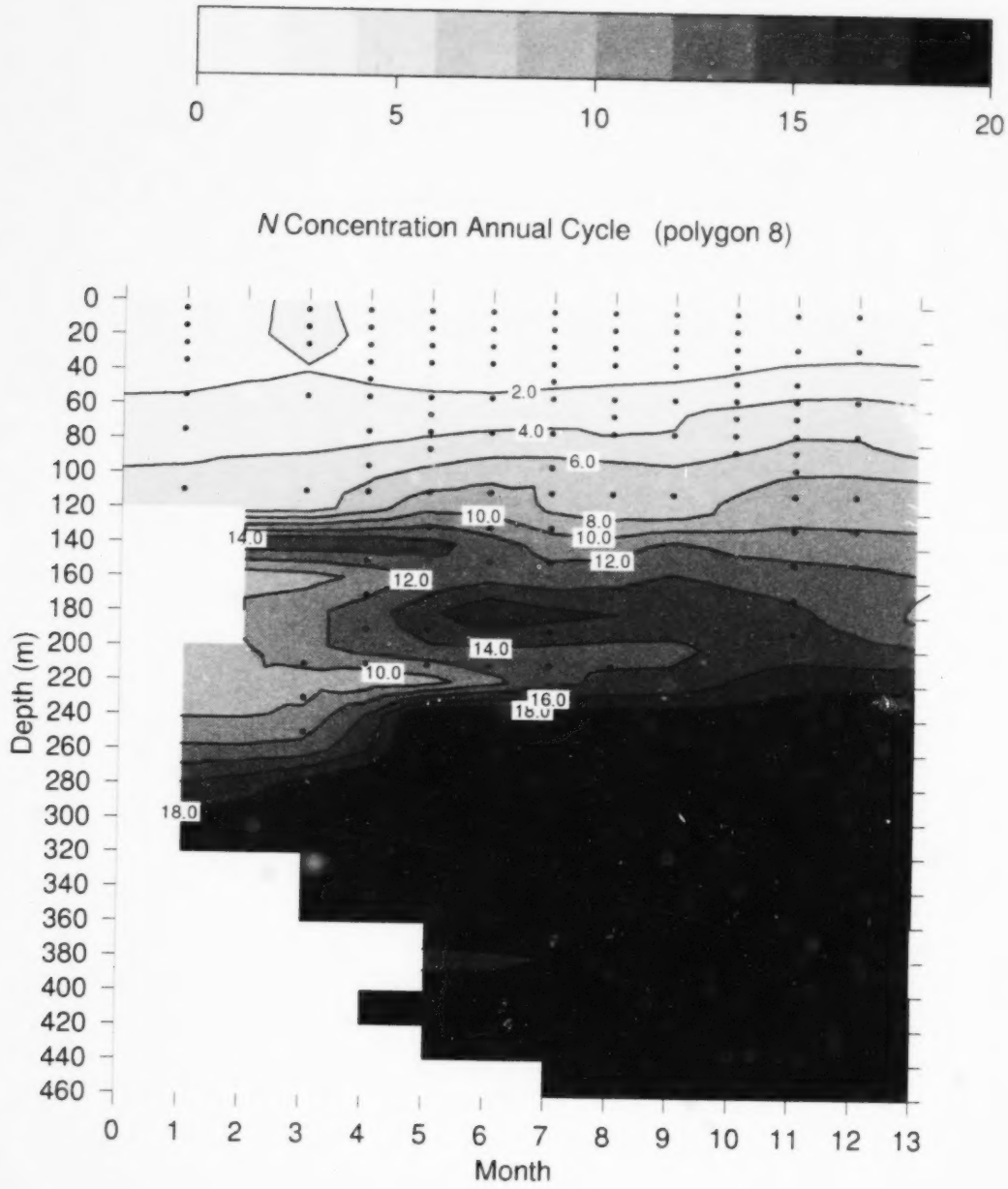

Figure 41: Annual cycle of average nitrate concentration (μM) for polygon 8.

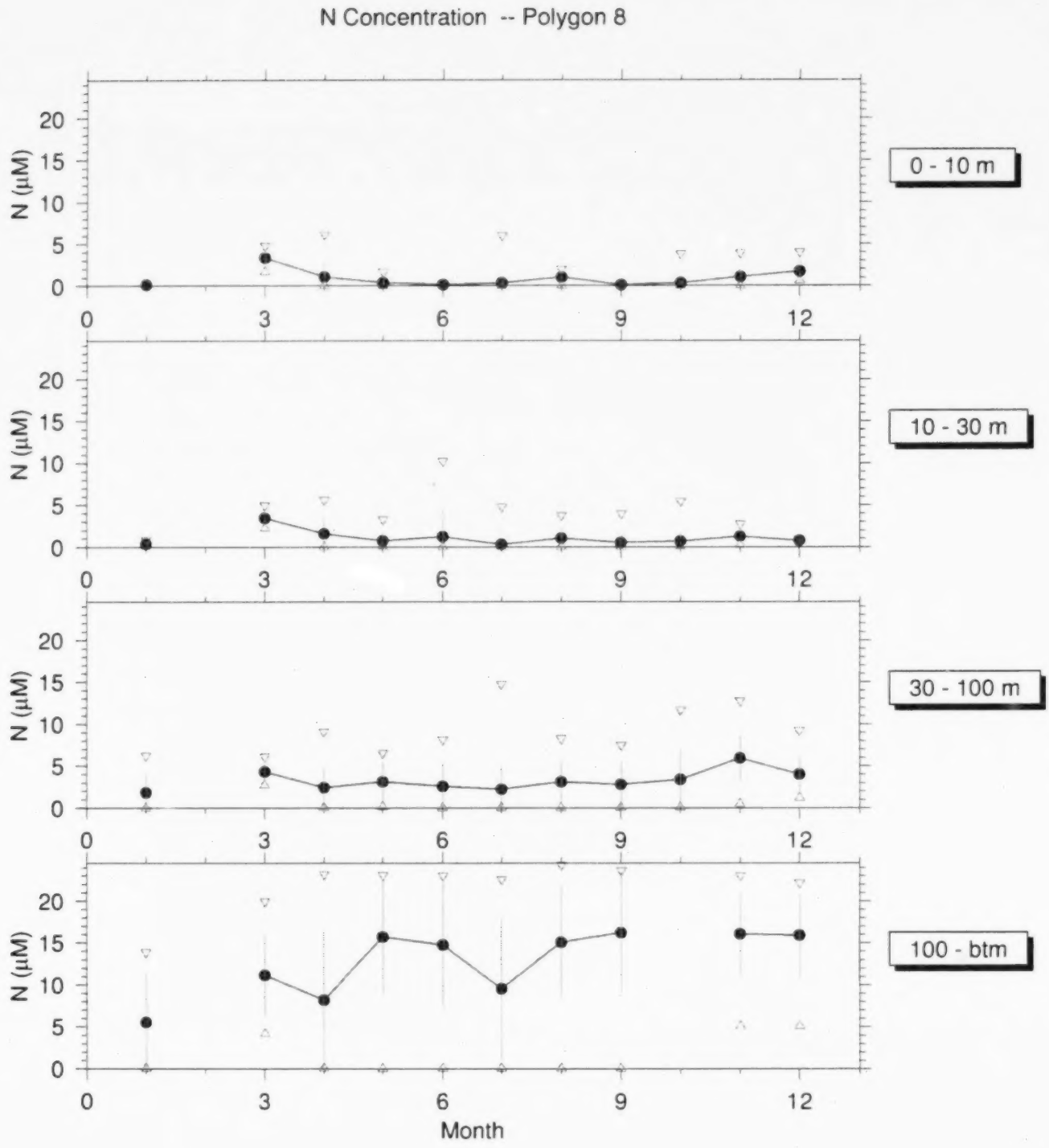

Figure 42: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 8. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

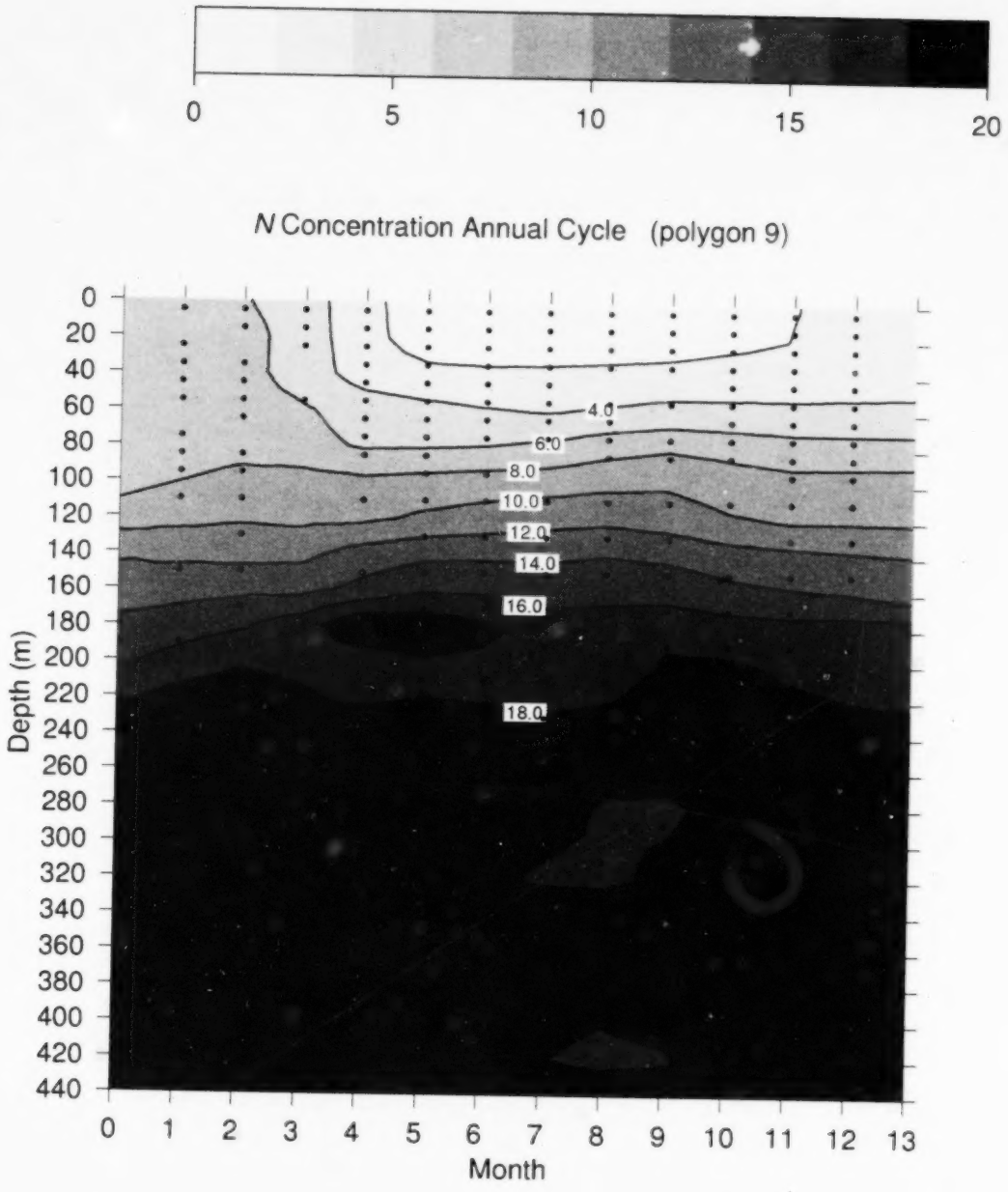

Figure 43: Annual cycle of average nitrate concentration (μM) for polygon 9.

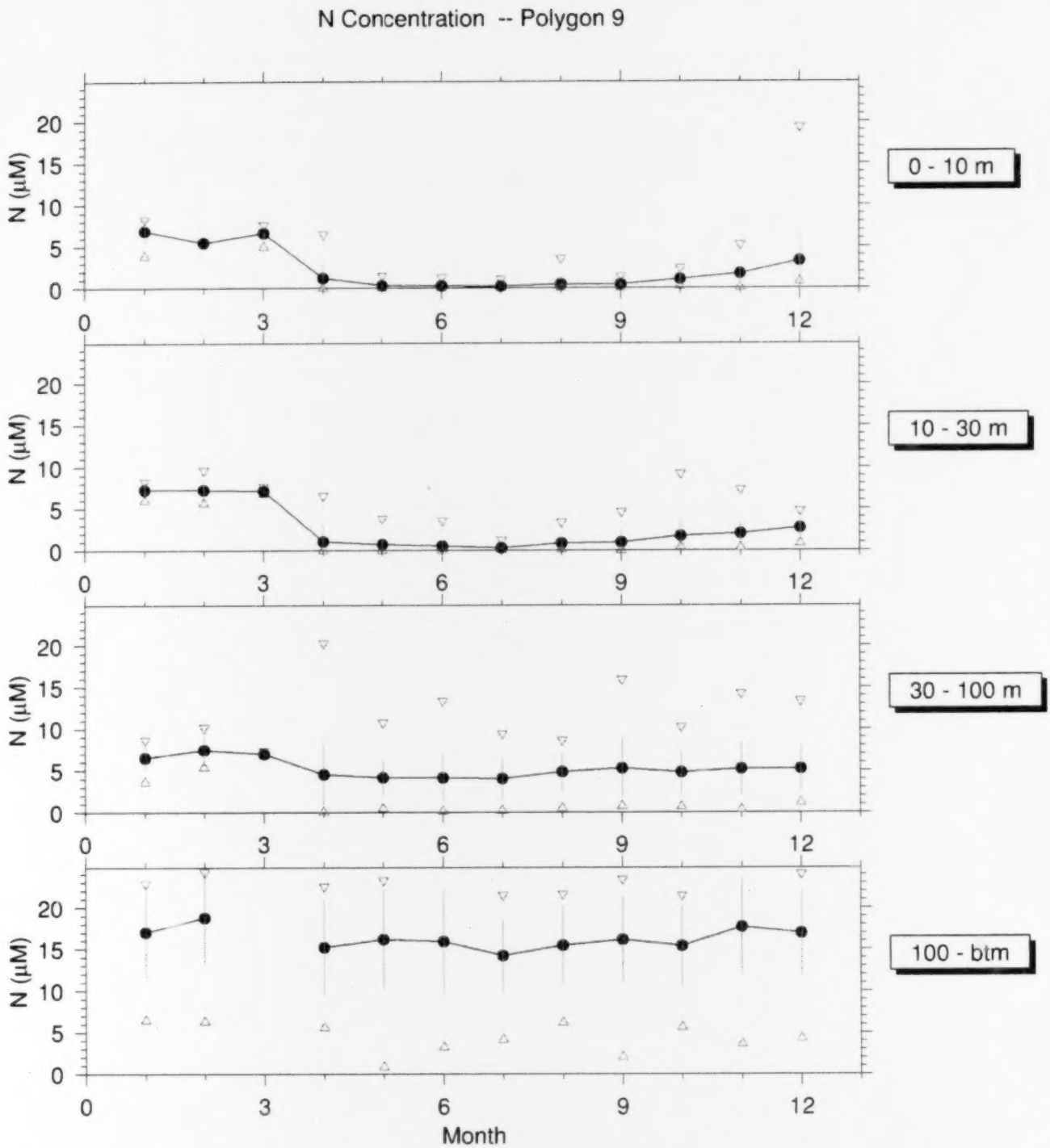

Figure 44: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 9. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

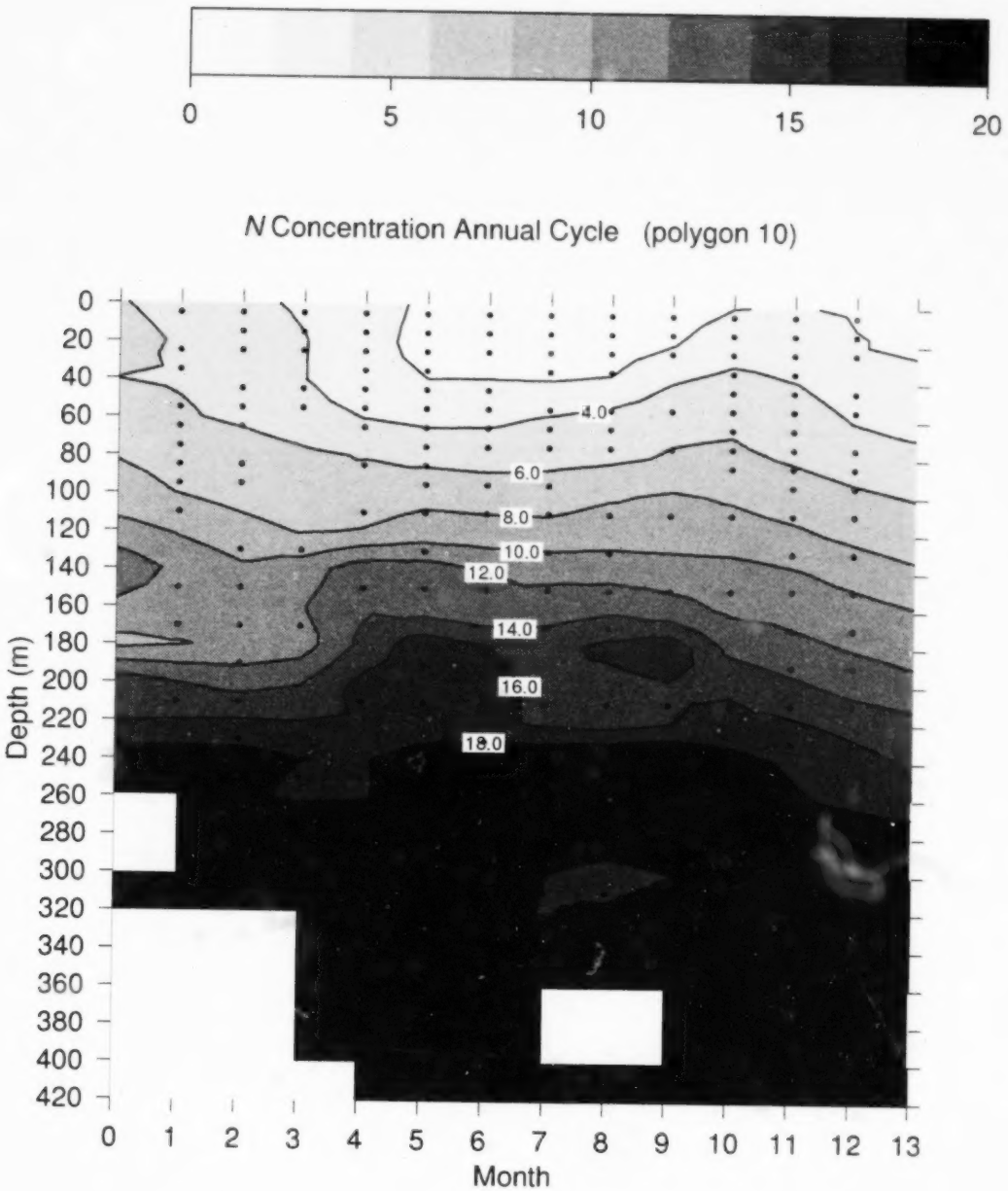

Figure 45: Annual cycle of average nitrate concentration (μM) for polygon 10.

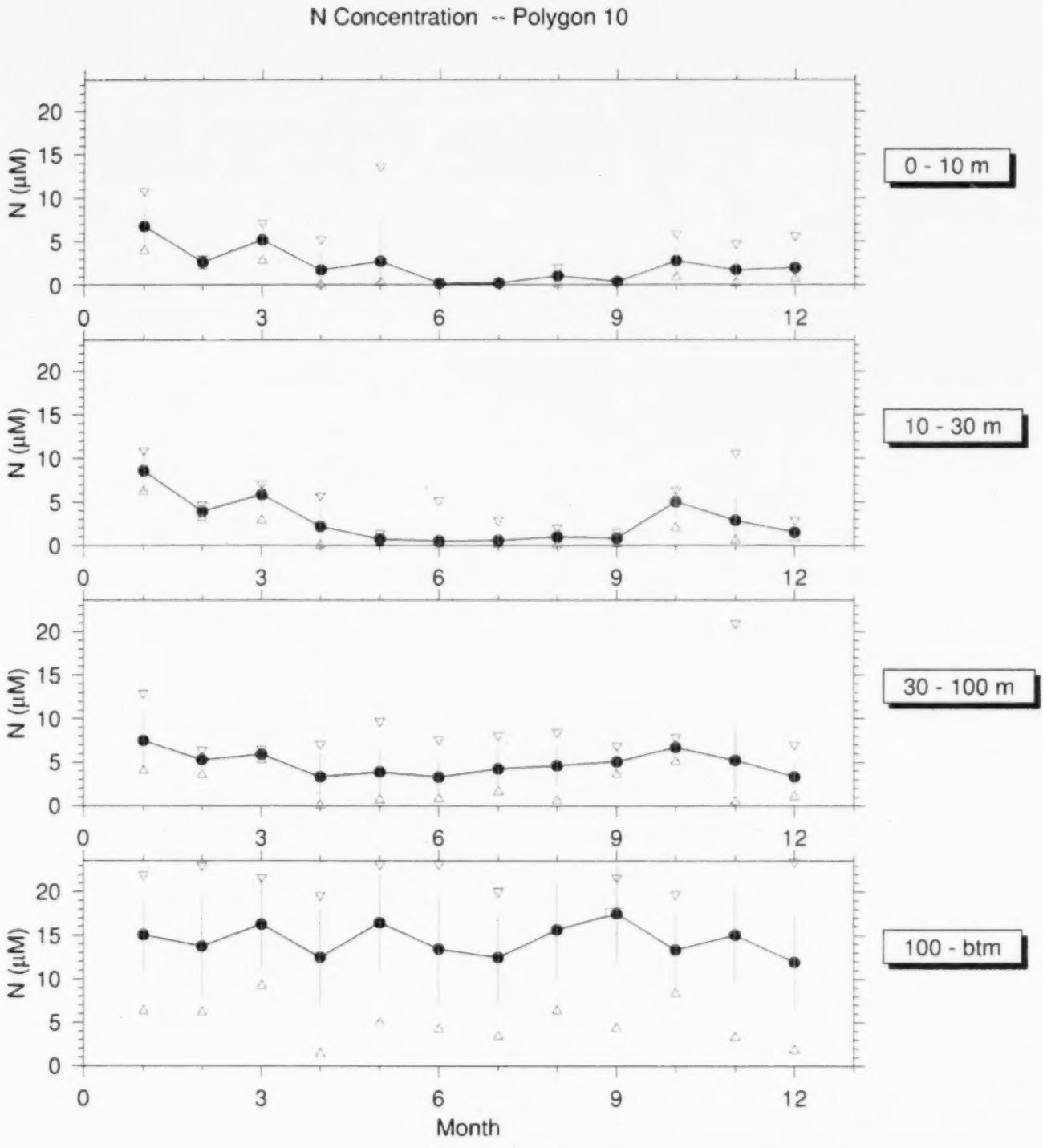

Figure 46: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 10. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

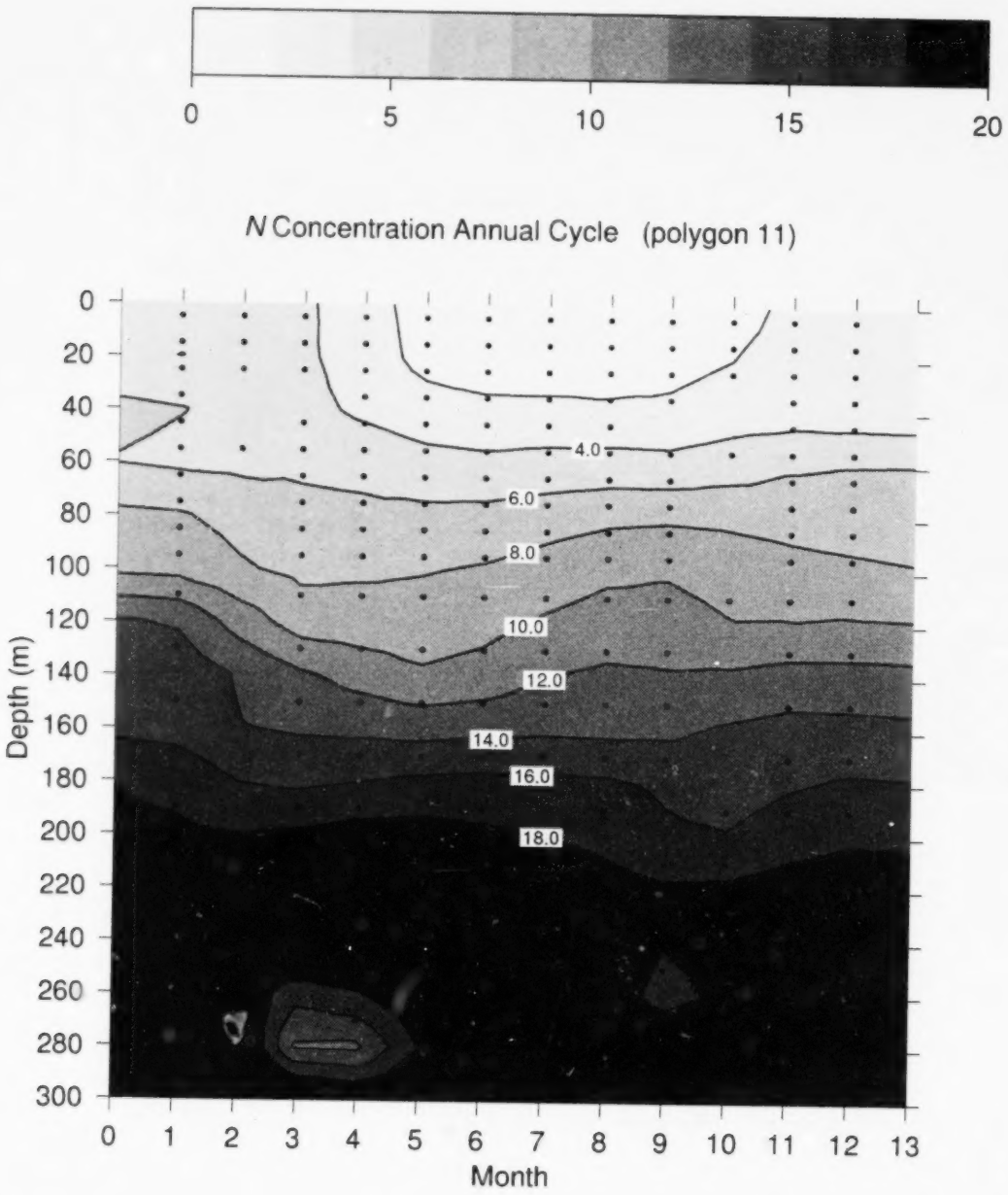

Figure 47: Annual cycle of average nitrate concentration (μM) for polygon 11.

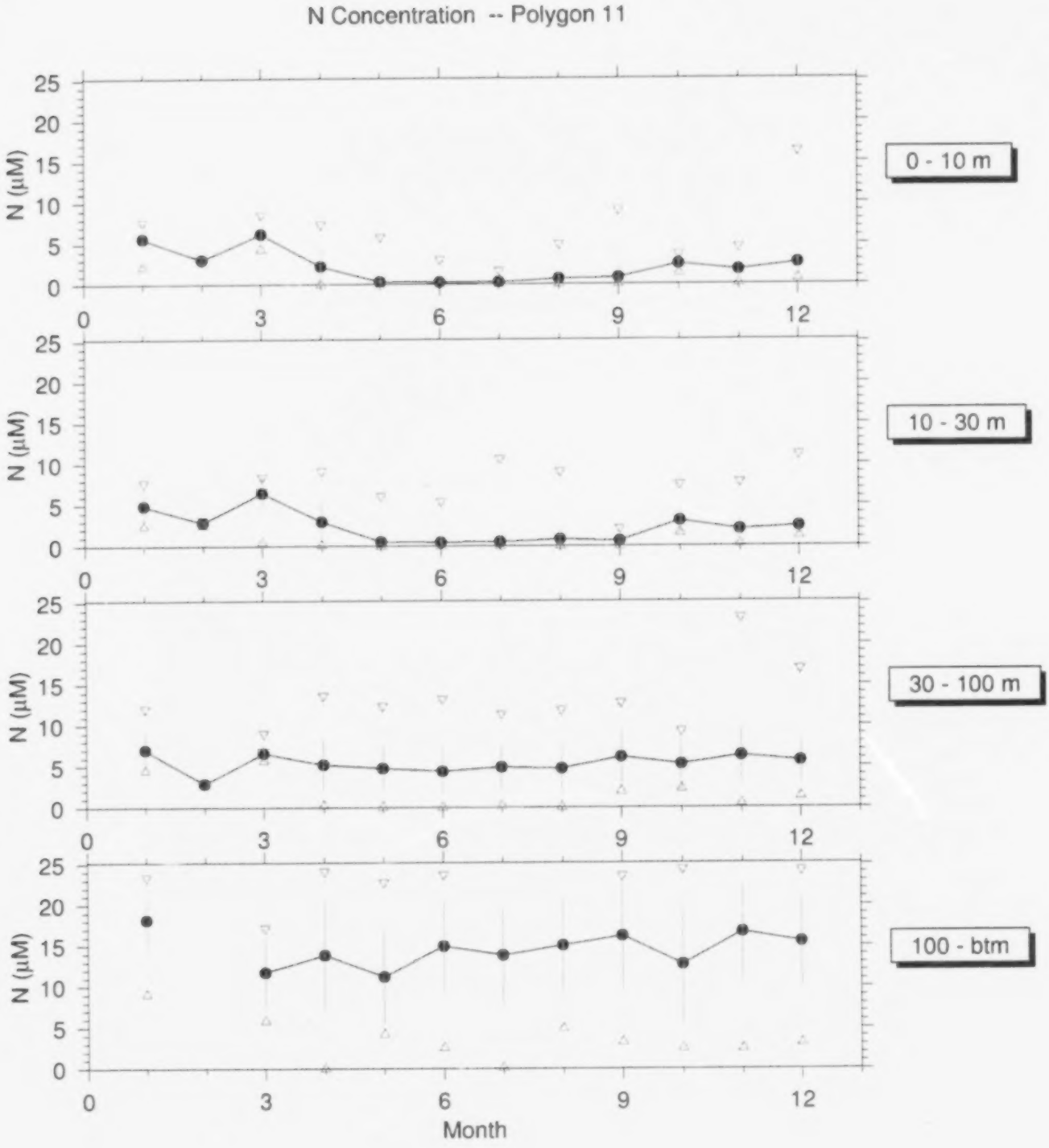

Figure 48: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 11. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

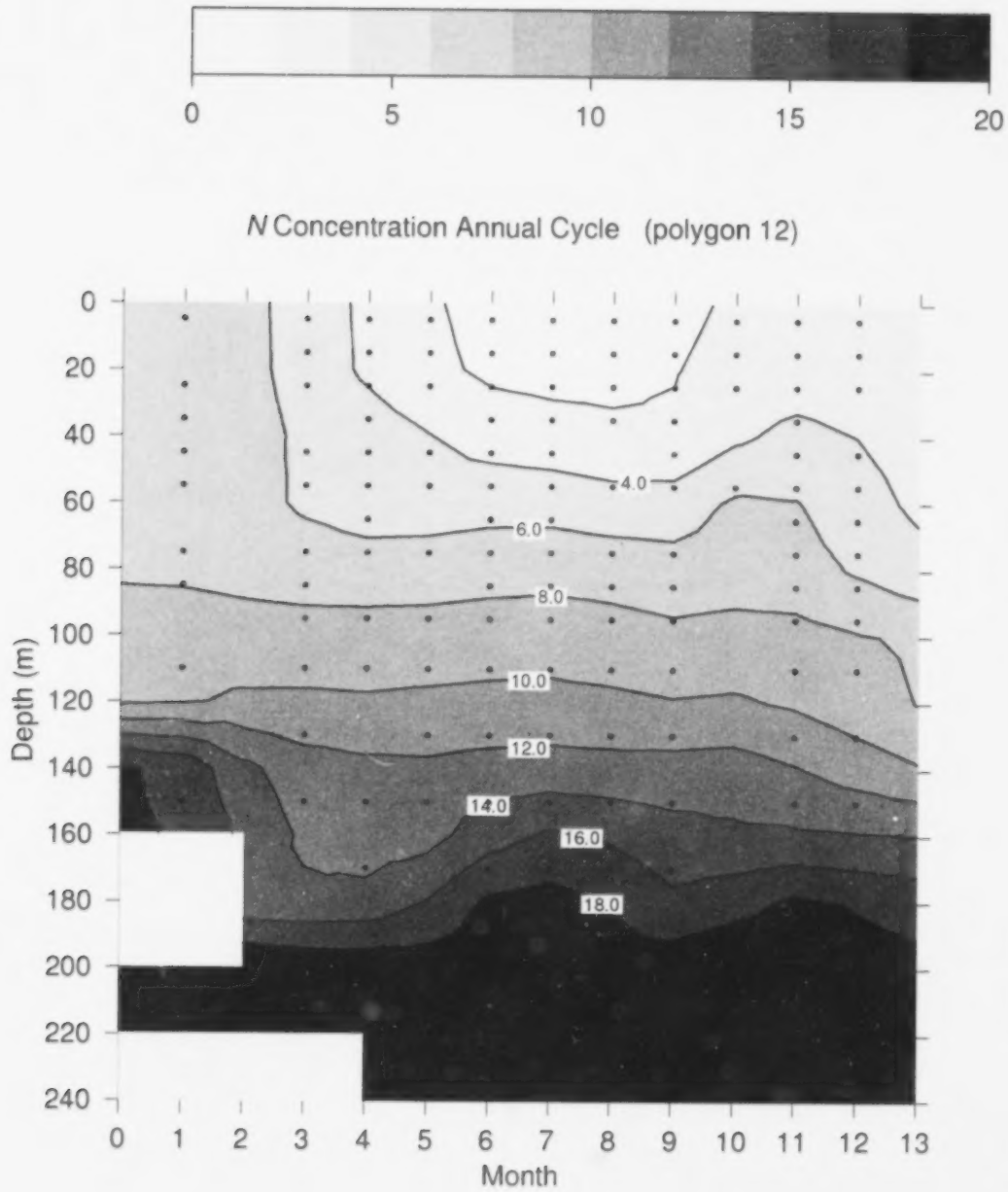

Figure 49: Annual cycle of average nitrate concentration (μM) for polygon 12.

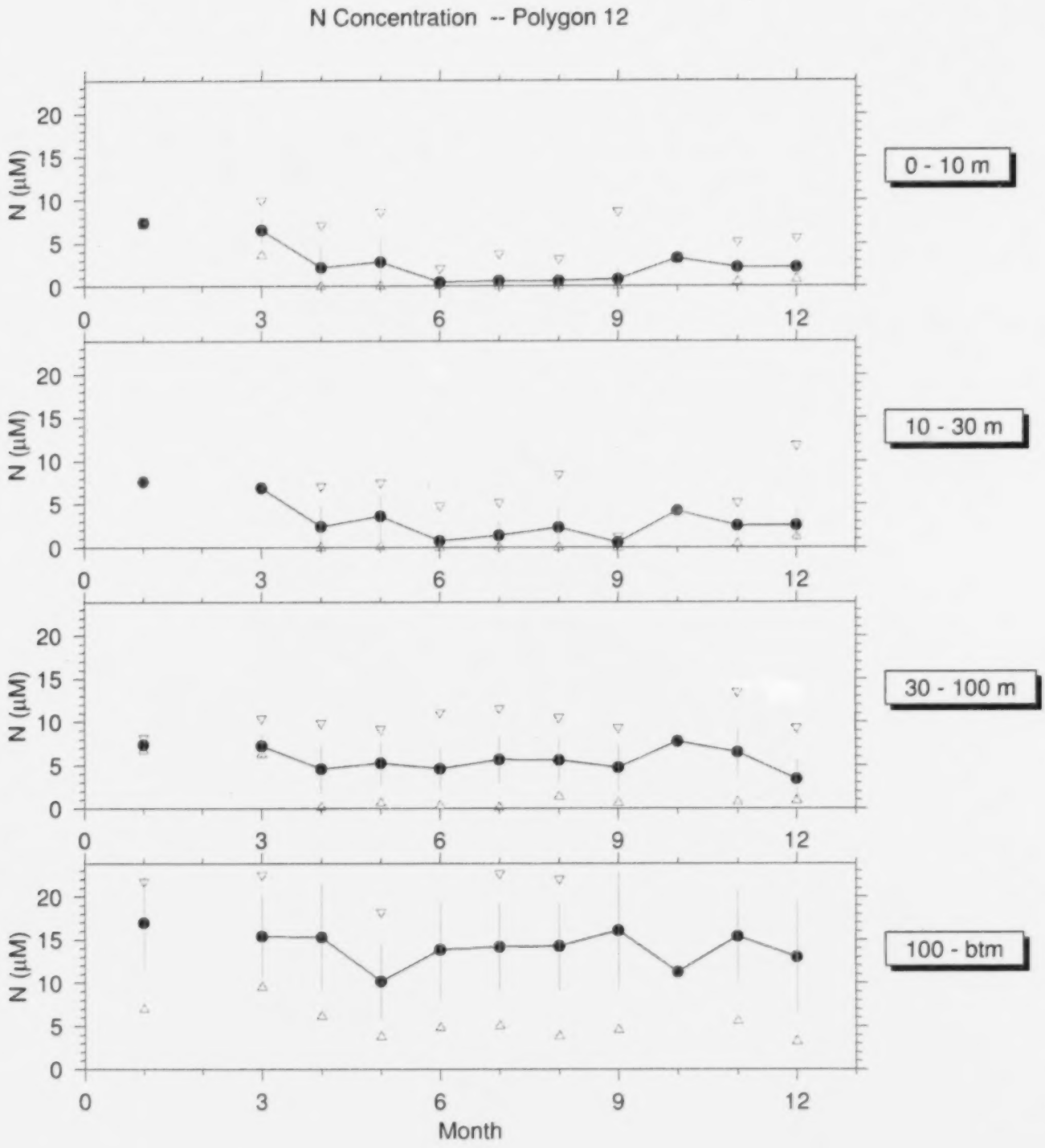

Figure 50: Timeseries of average nitrate concentration (μM) for four depth intervals for polygon 12. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

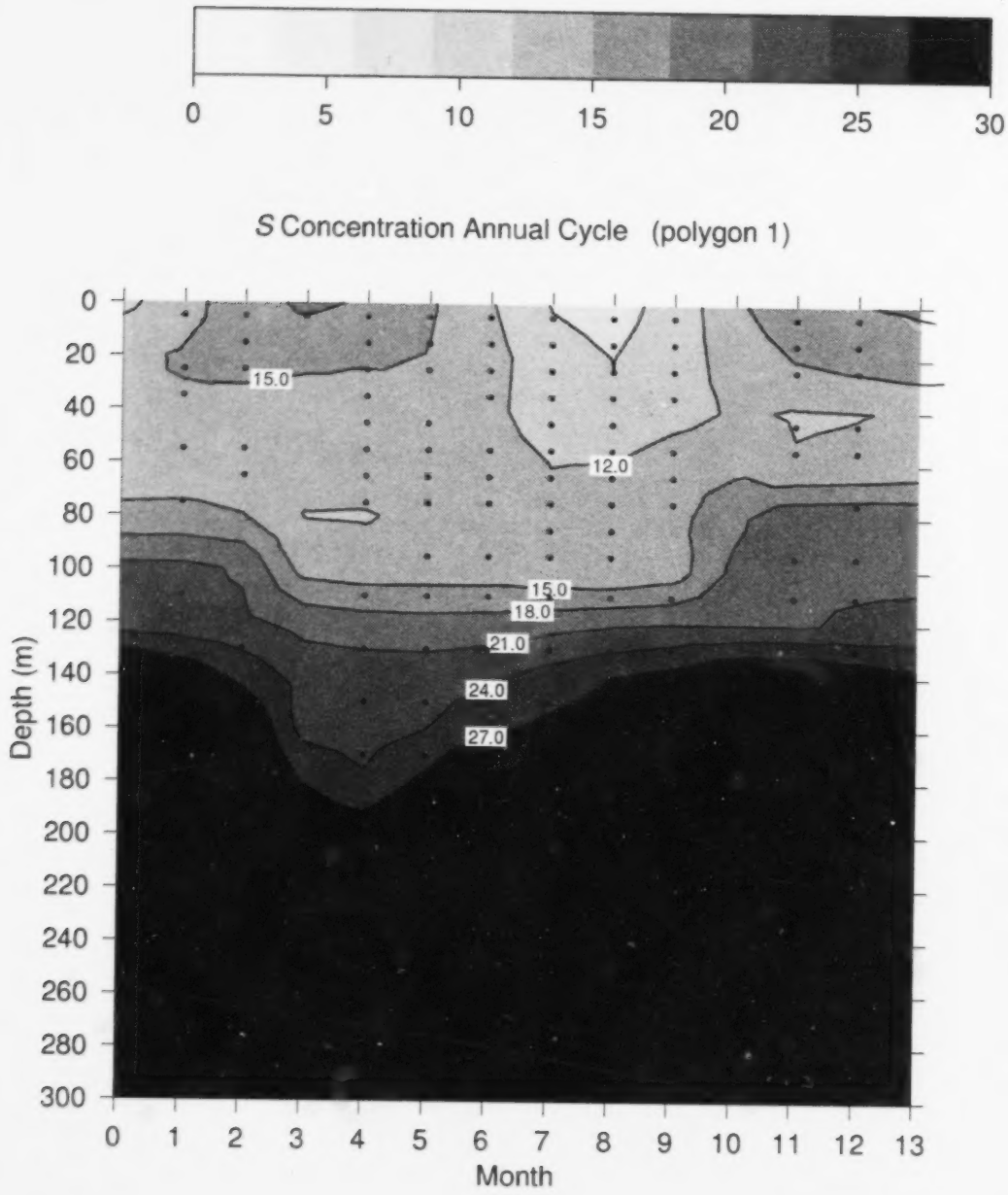

Figure 51: Annual cycle of average silicate concentration (μM) for polygon 1.

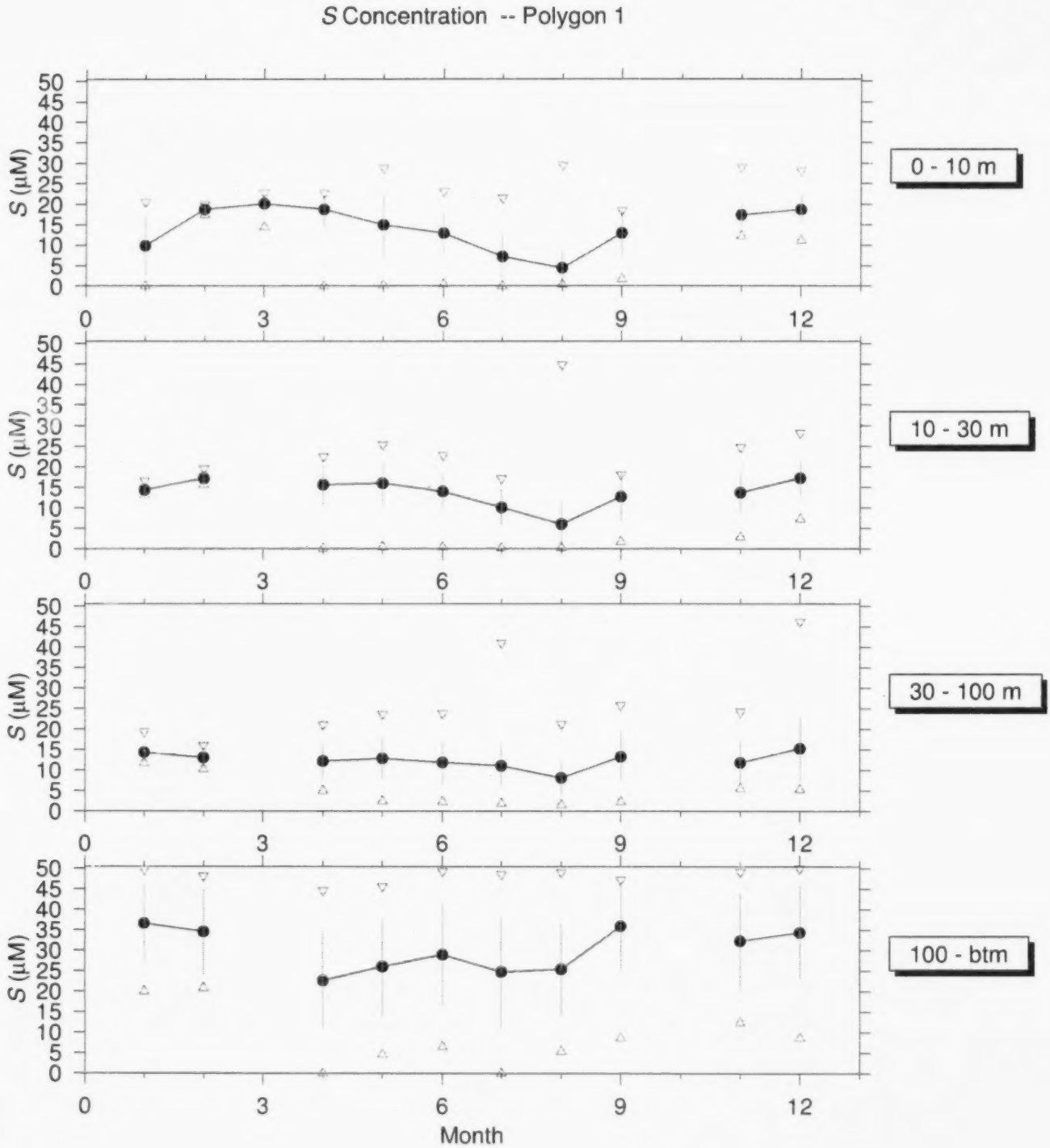

Figure 52: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 1. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

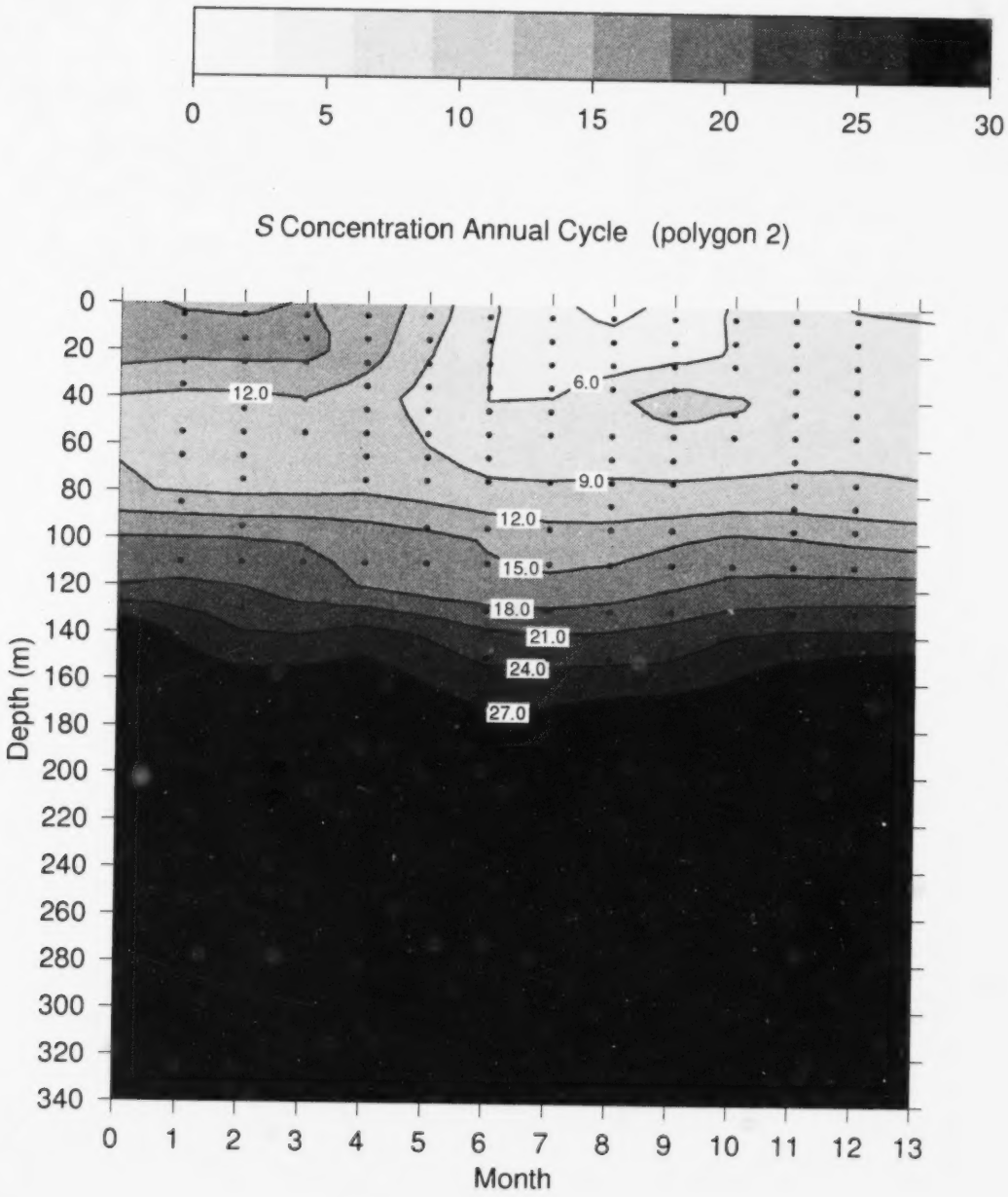

Figure 53: Annual cycle of average silicate concentration (μM) for polygon 2.

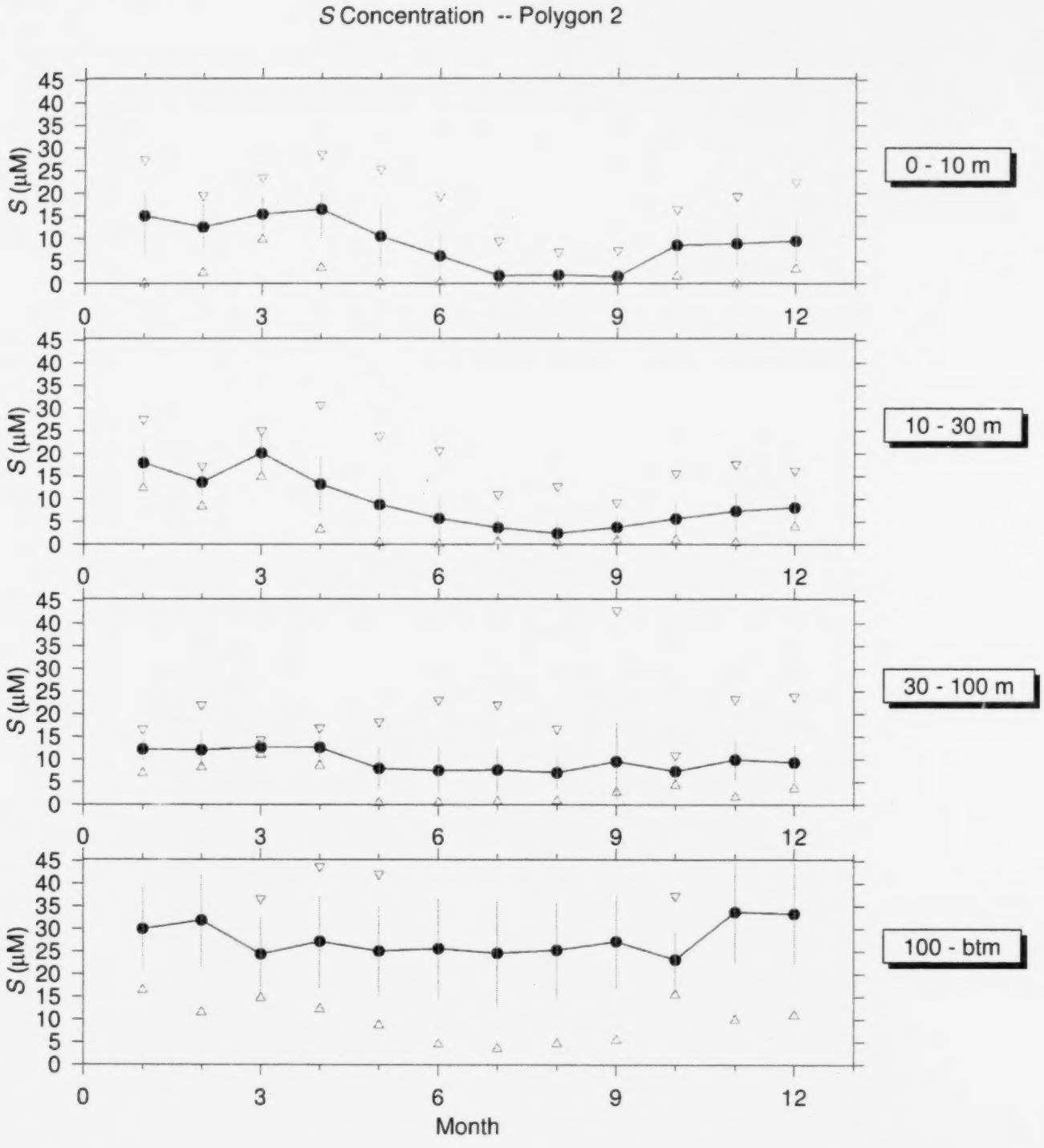

Figure 54: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 2. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

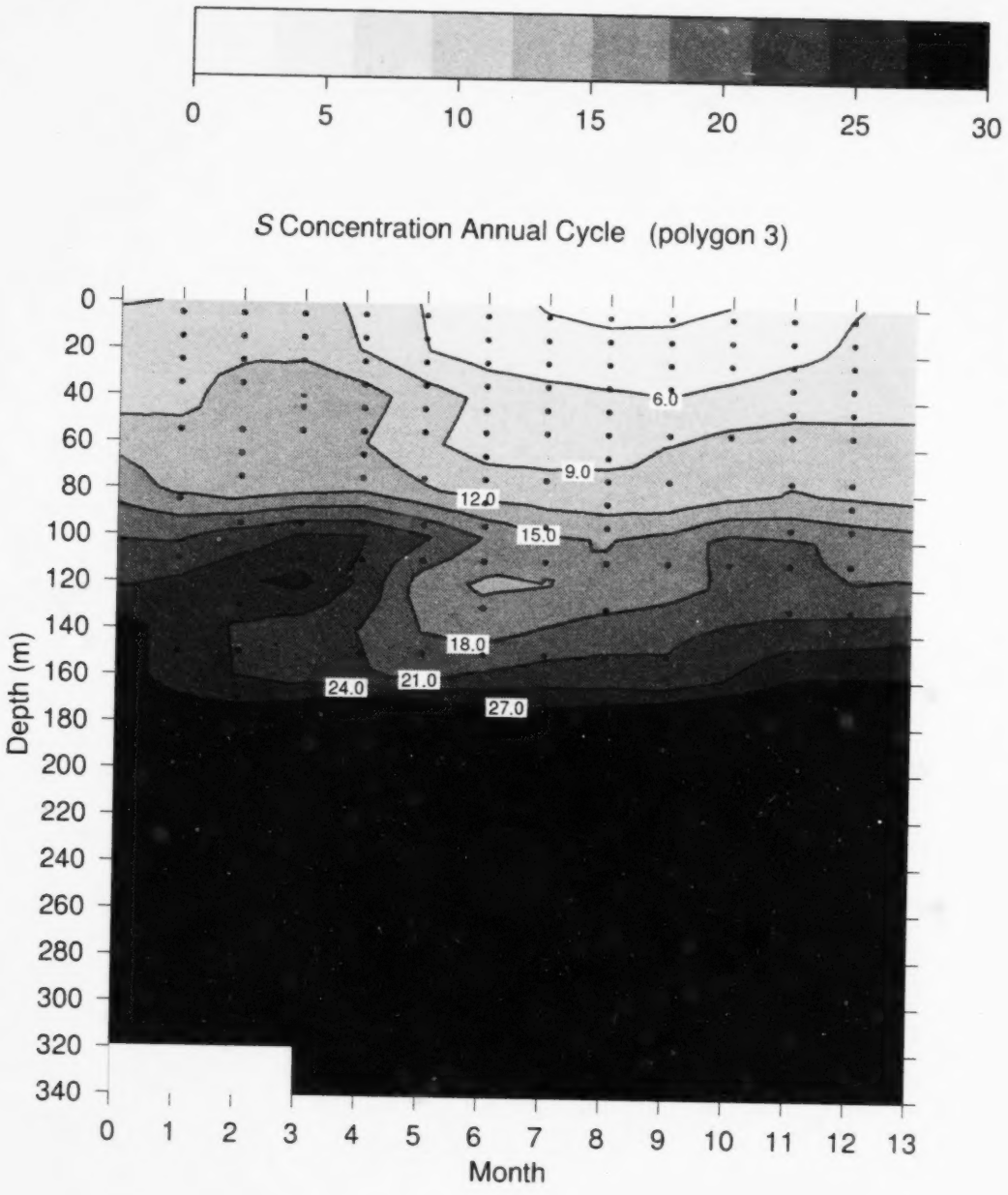

Figure 55: Annual cycle of average silicate concentration (μM) for polygon 3.

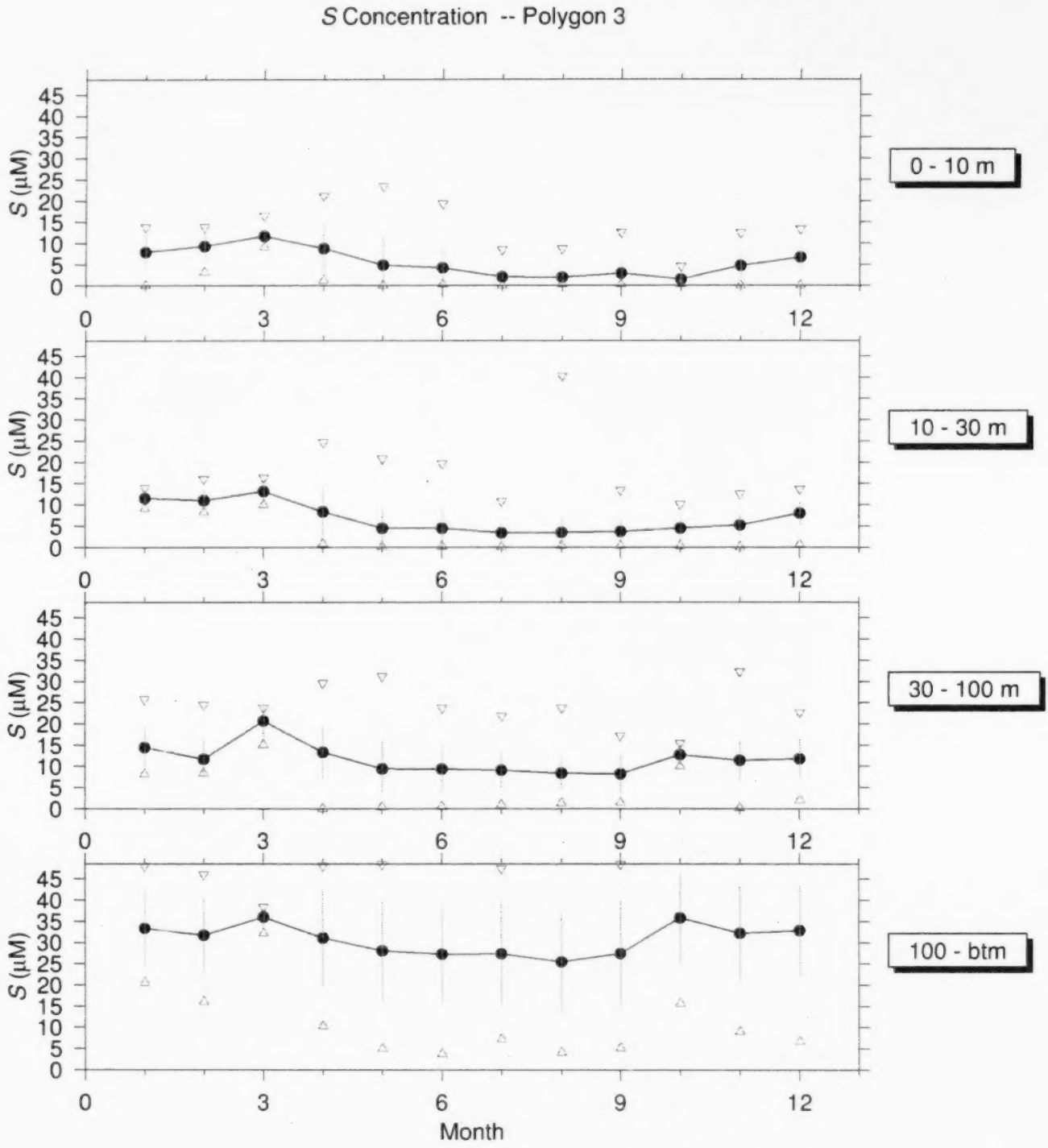

Figure 56: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 3. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

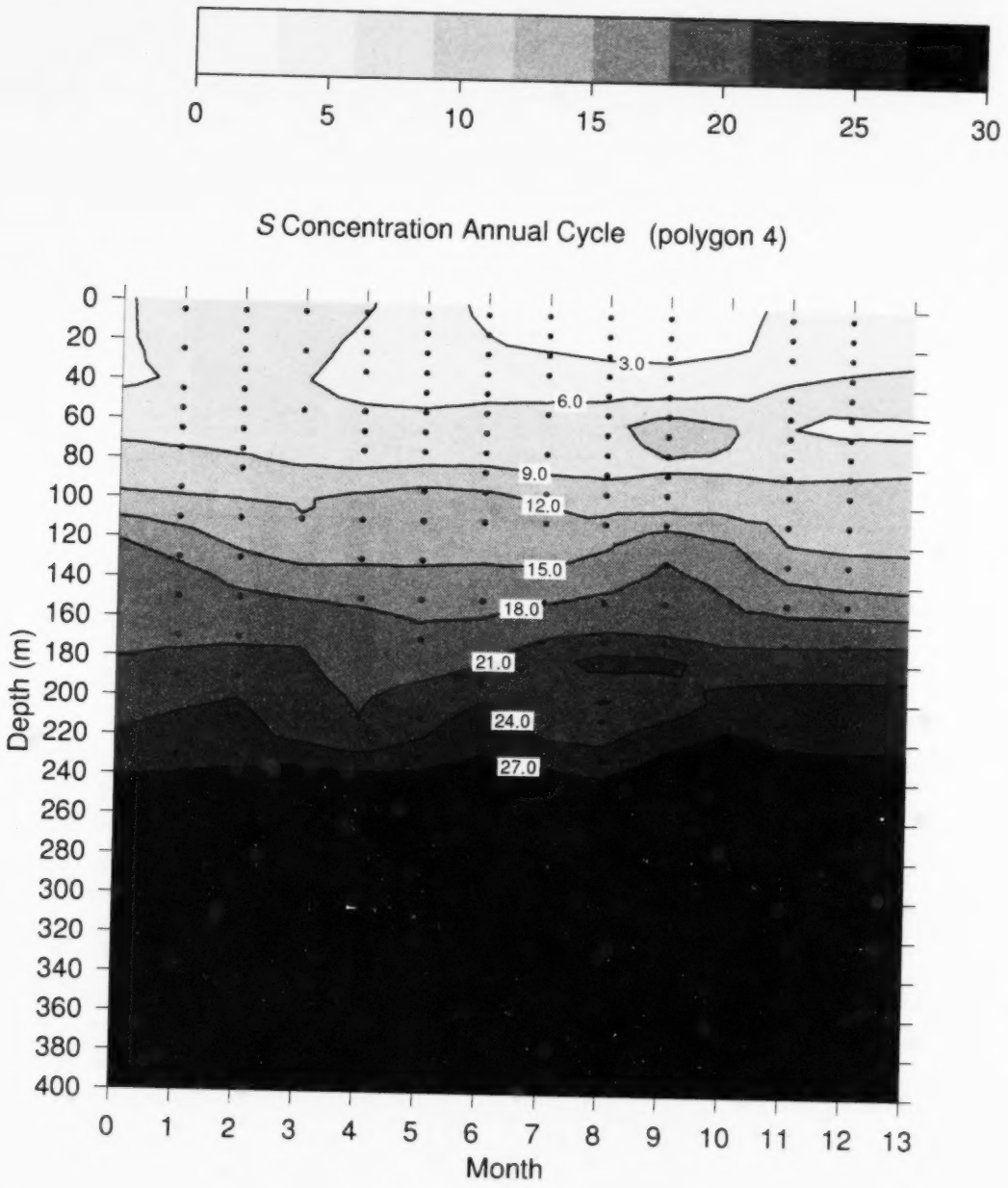

Figure 57: Annual cycle of average silicate concentration (μM) for polygon 4.

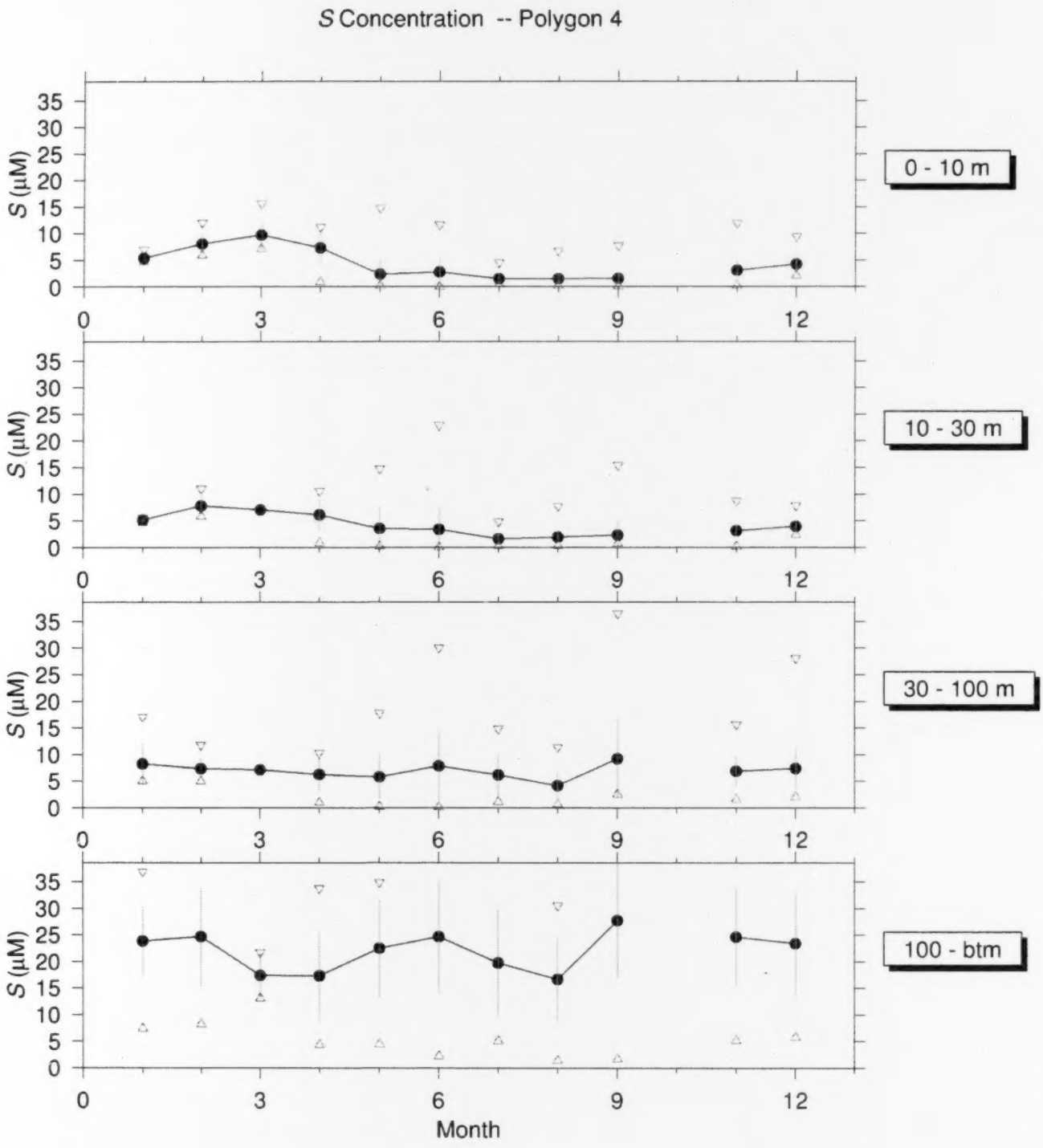

Figure 58: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 4. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

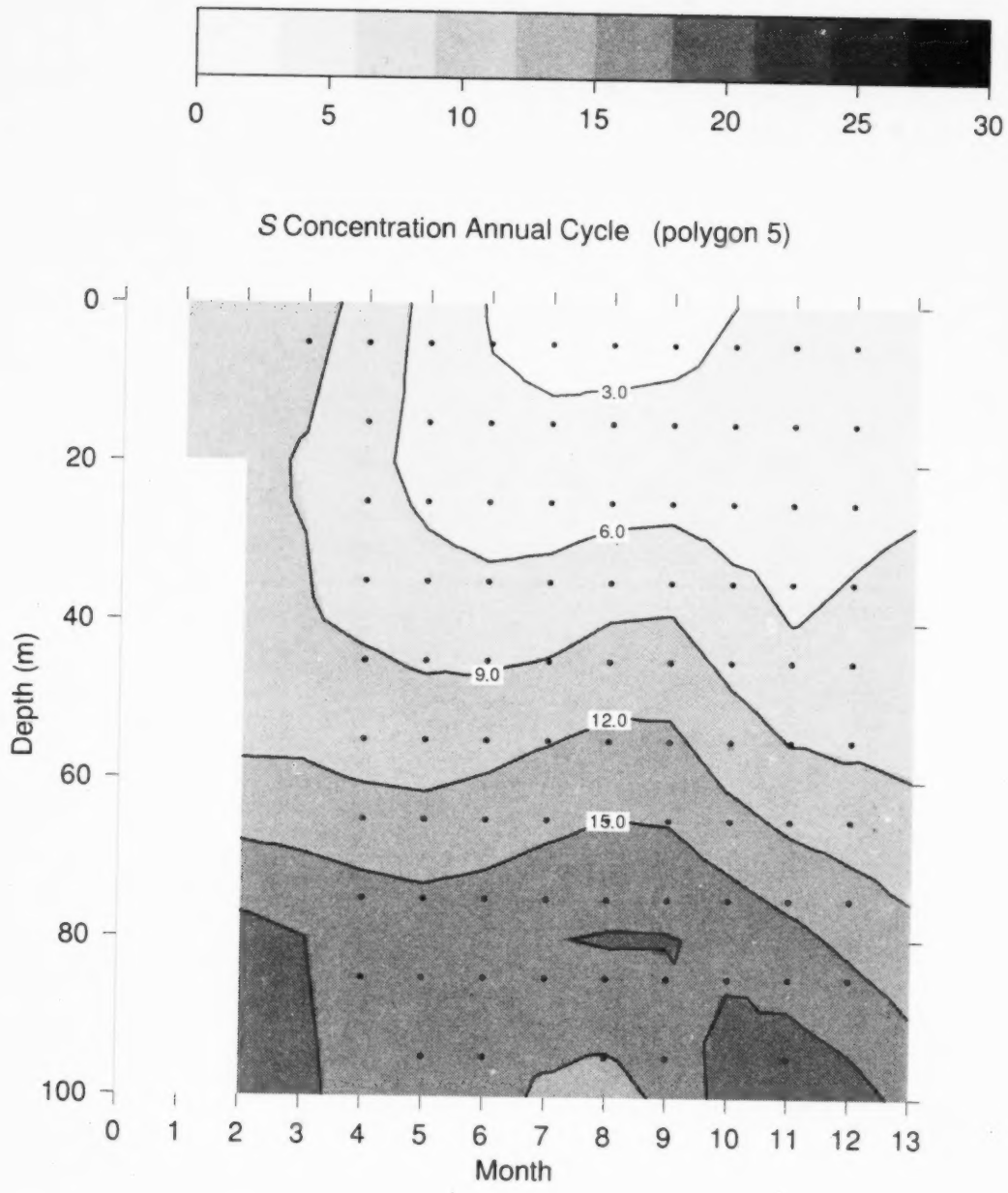

Figure 59: Annual cycle of average silicate concentration (μM) for polygon 5.

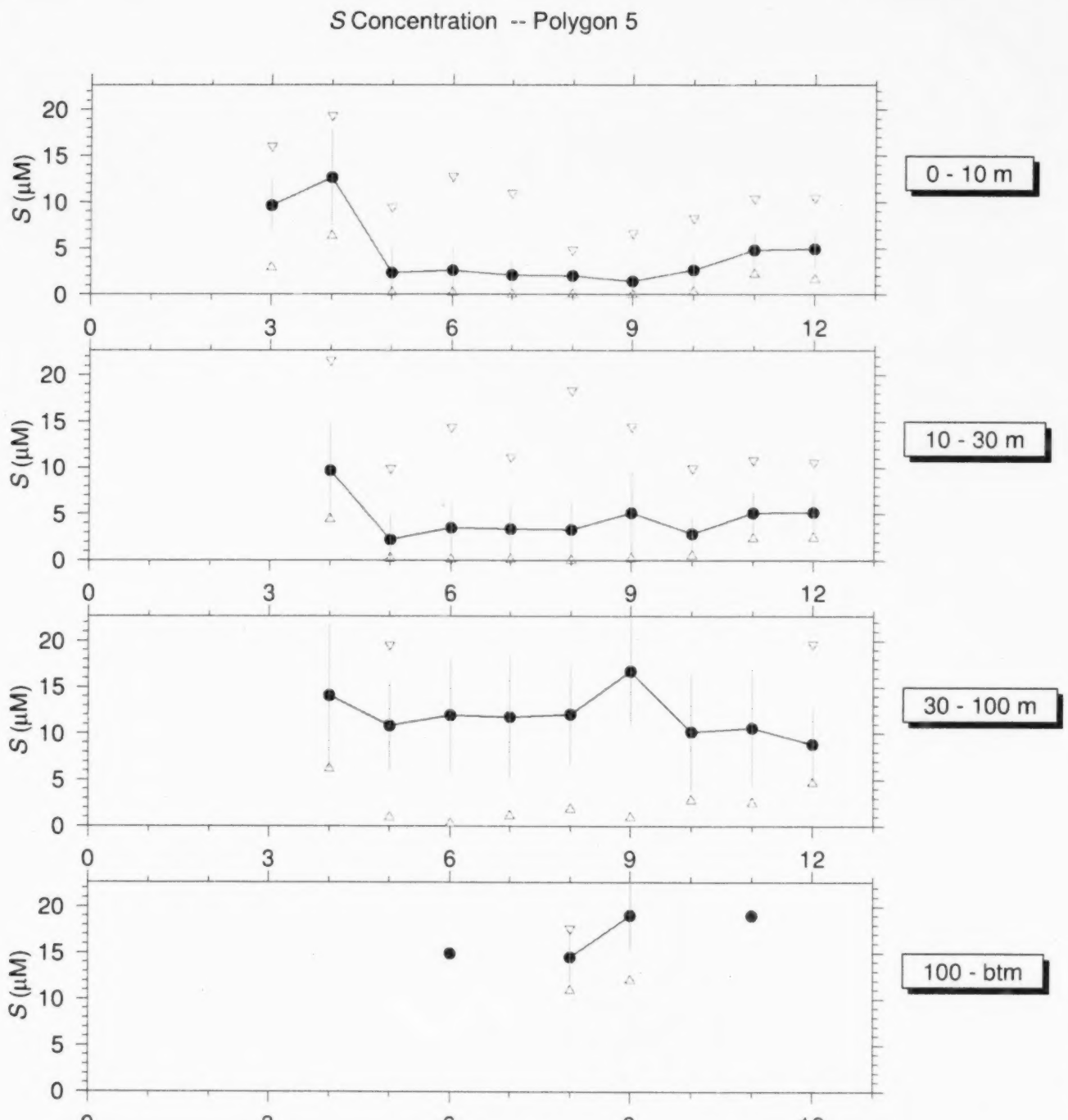

Figure 60: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 5. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

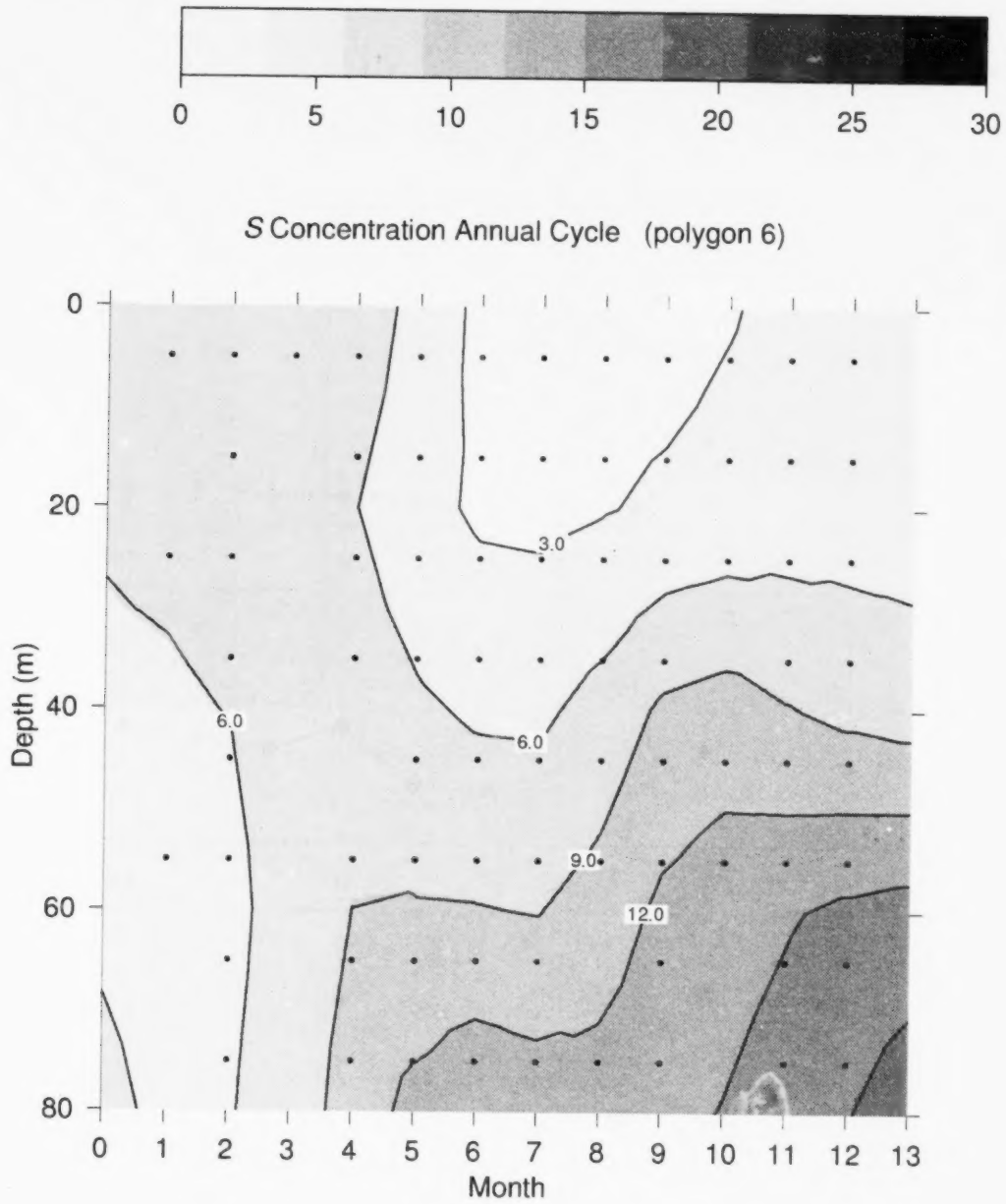

Figure 61: Annual cycle of average silicate concentration (μM) for polygon 6.

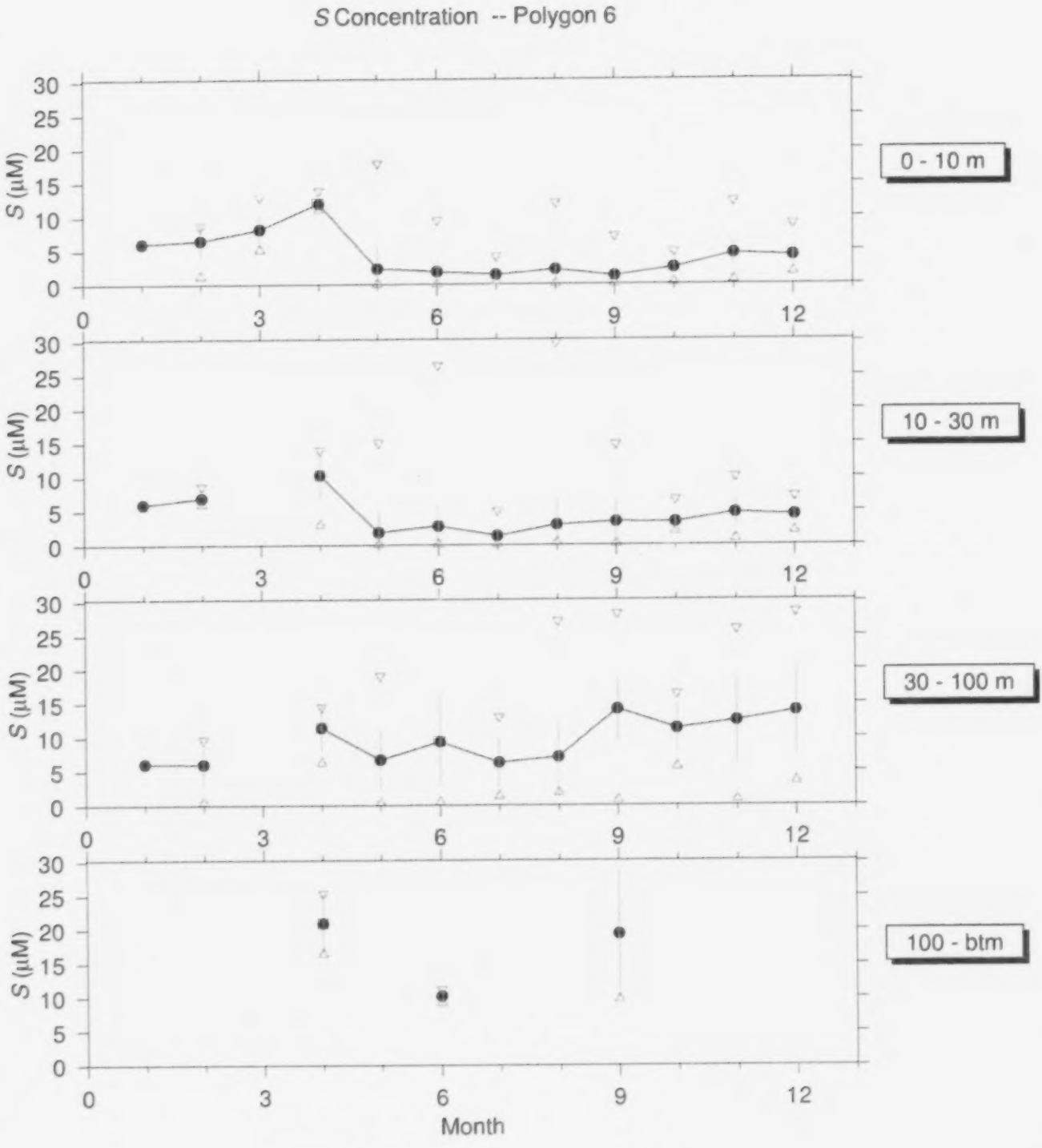

Figure 62: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 6. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

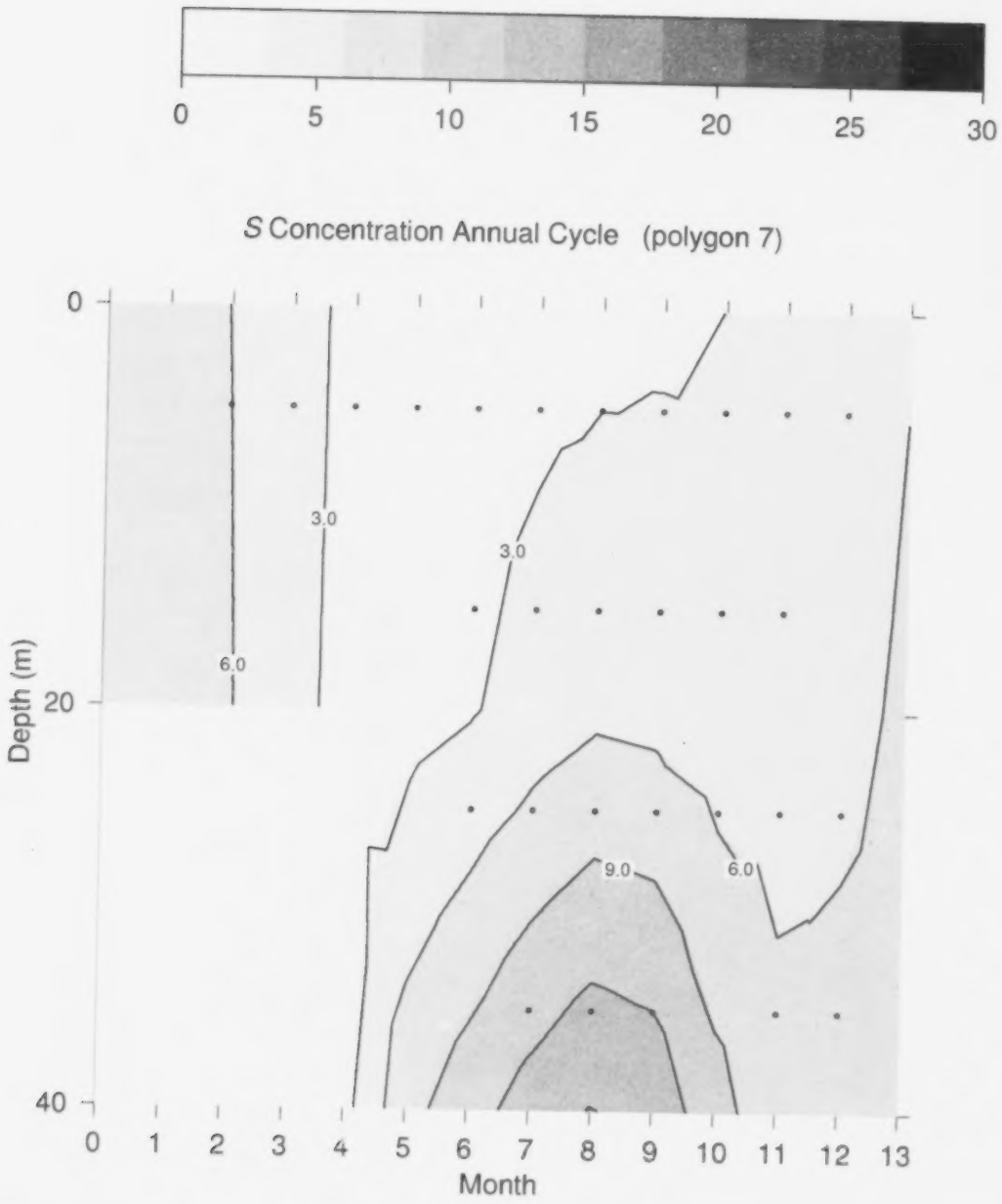

Figure 63: Annual cycle of average silicate concentration (μM) for polygon 7.

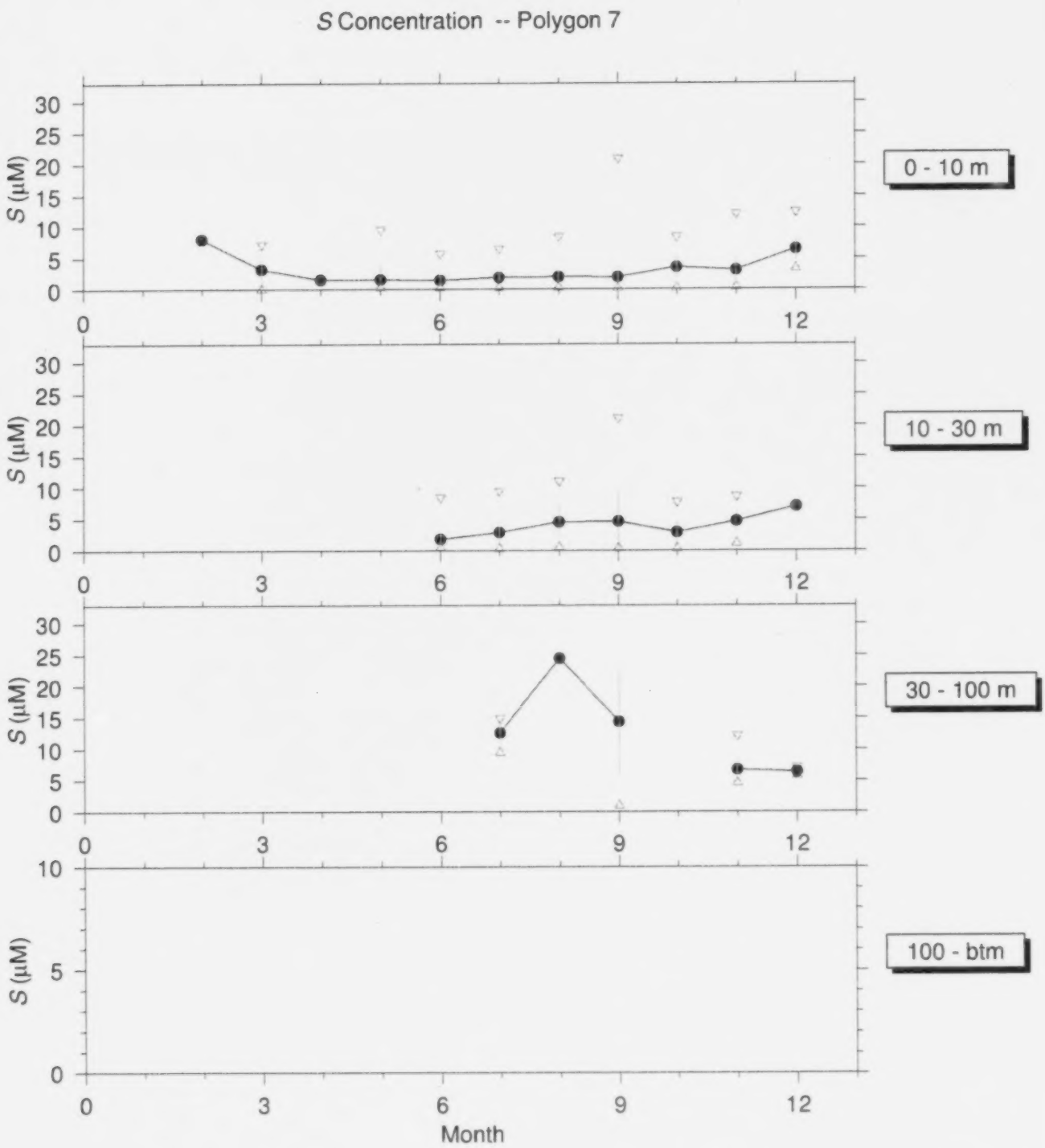

Figure 64: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 7. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

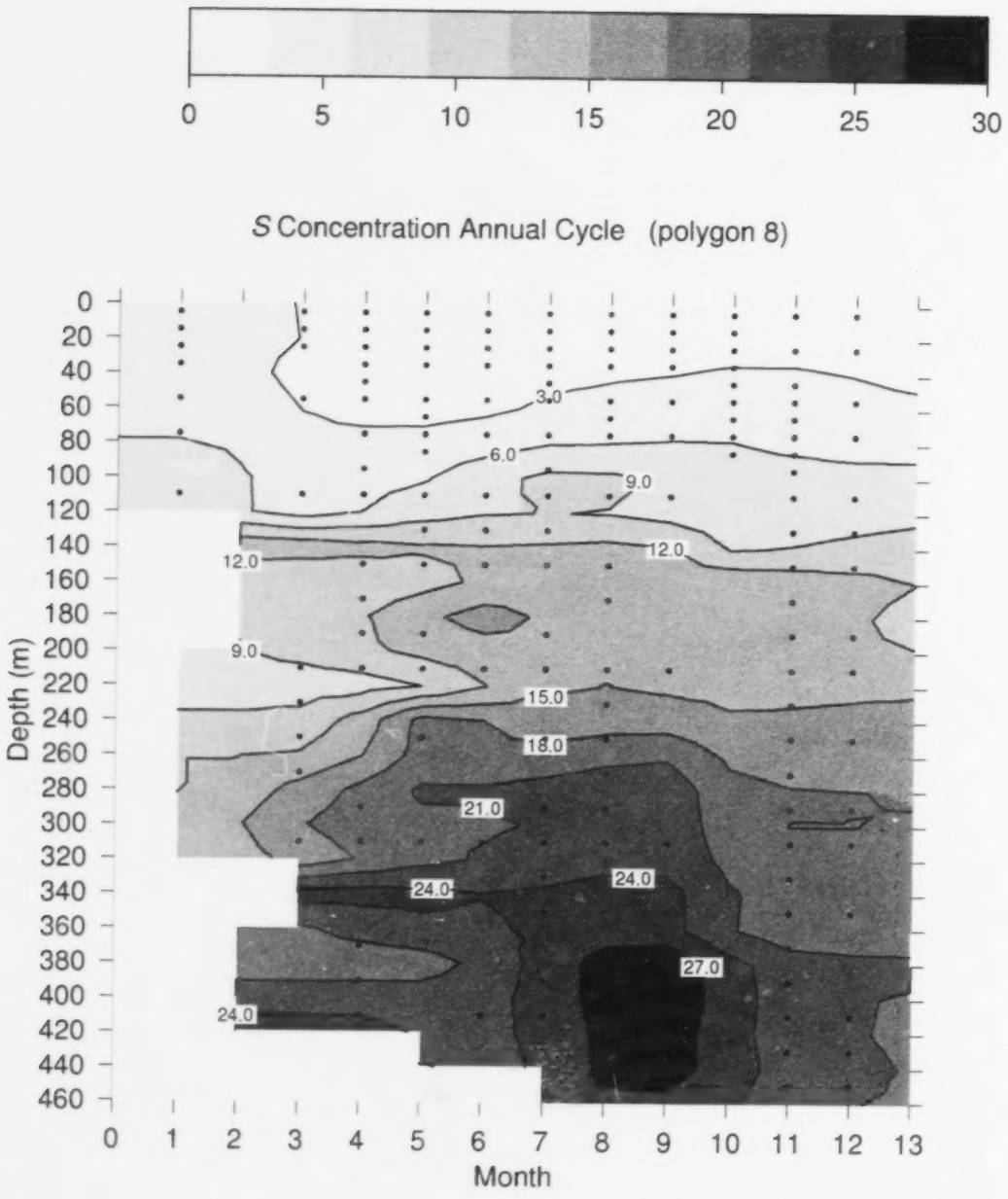

Figure 65: Annual cycle of average silicate concentration (μM) for polygon 8.

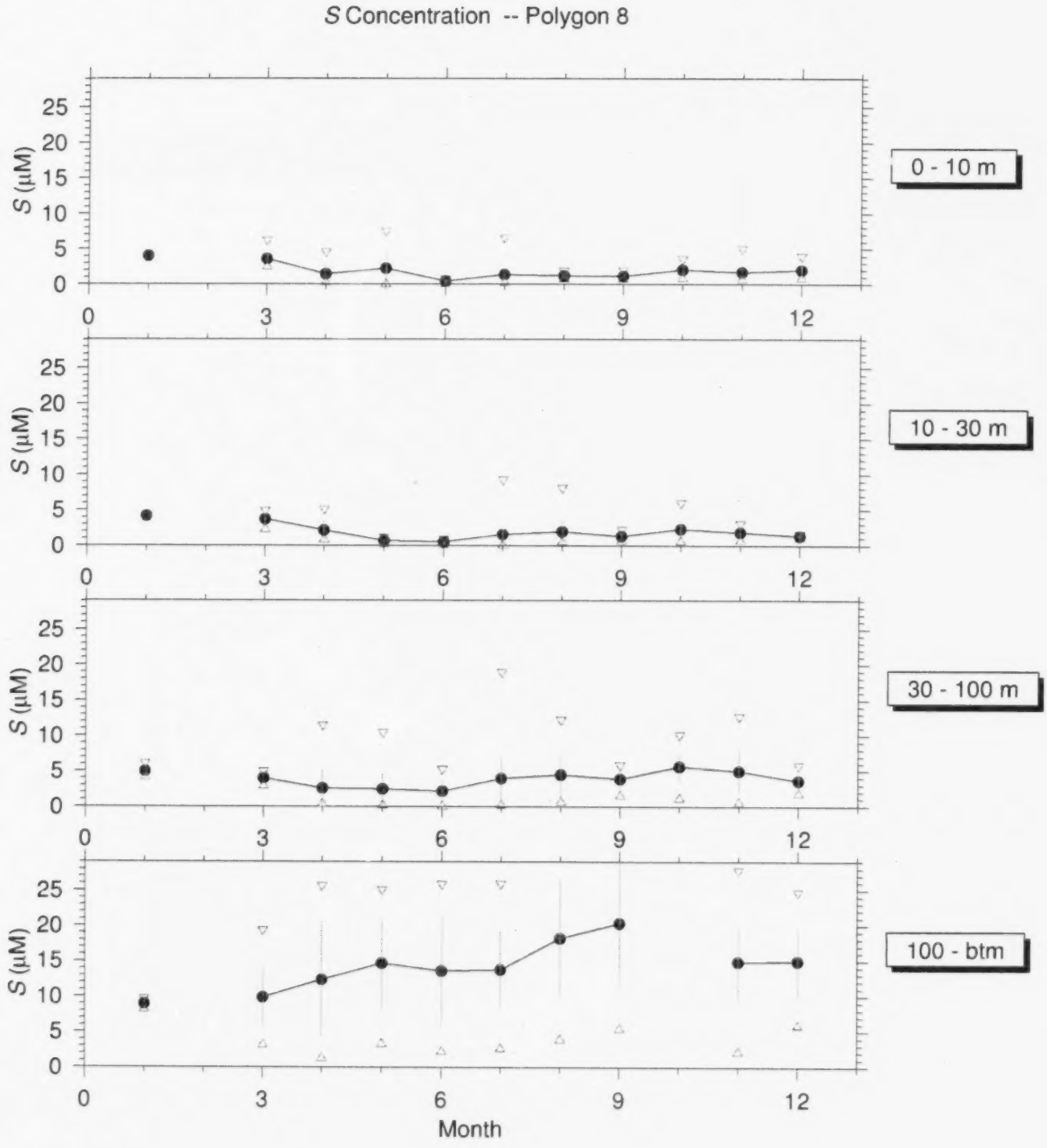

Figure 66: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 8. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

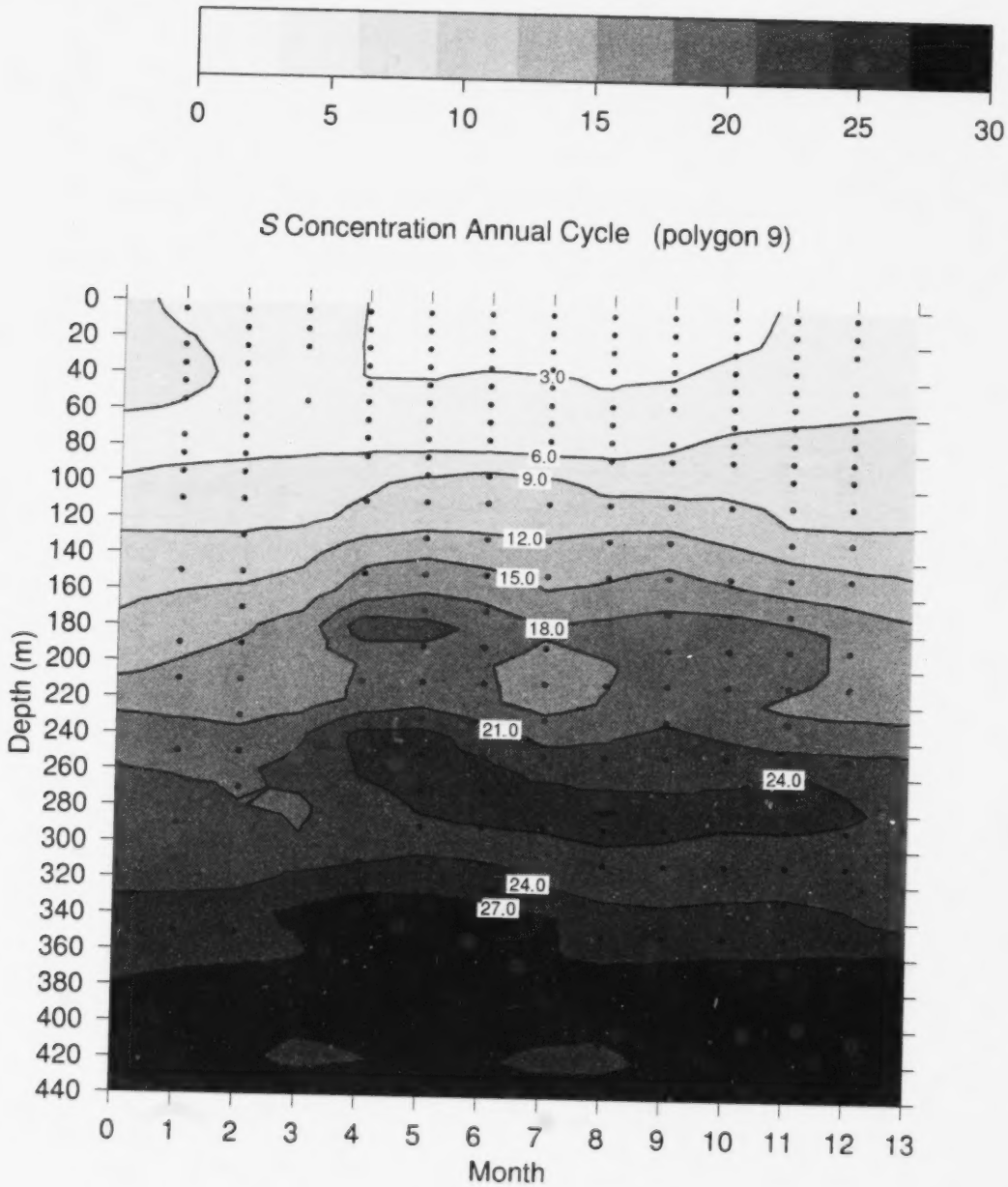

Figure 67: Annual cycle of average silicate concentration (μM) for polygon 9.

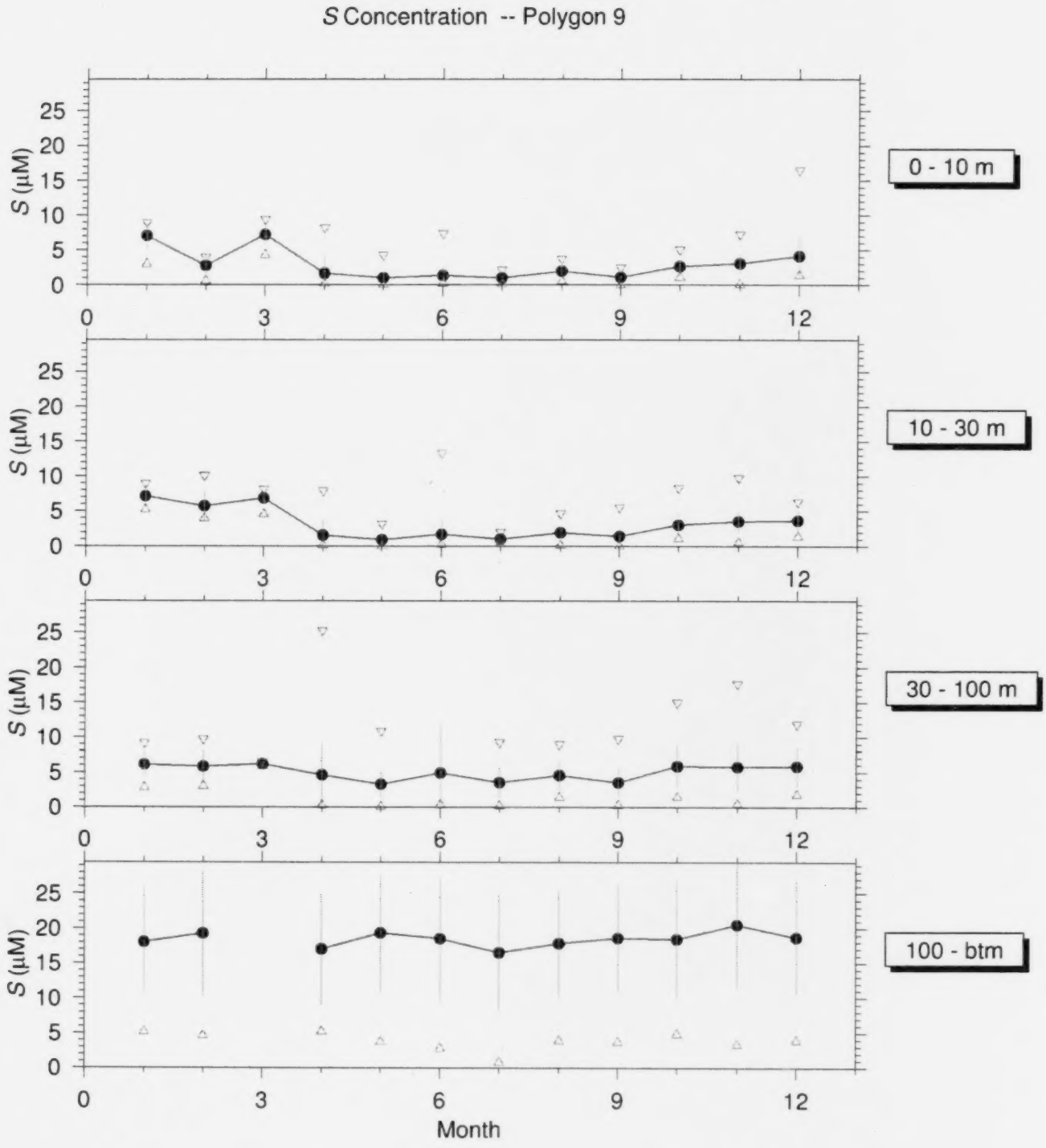

Figure 68: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 9. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

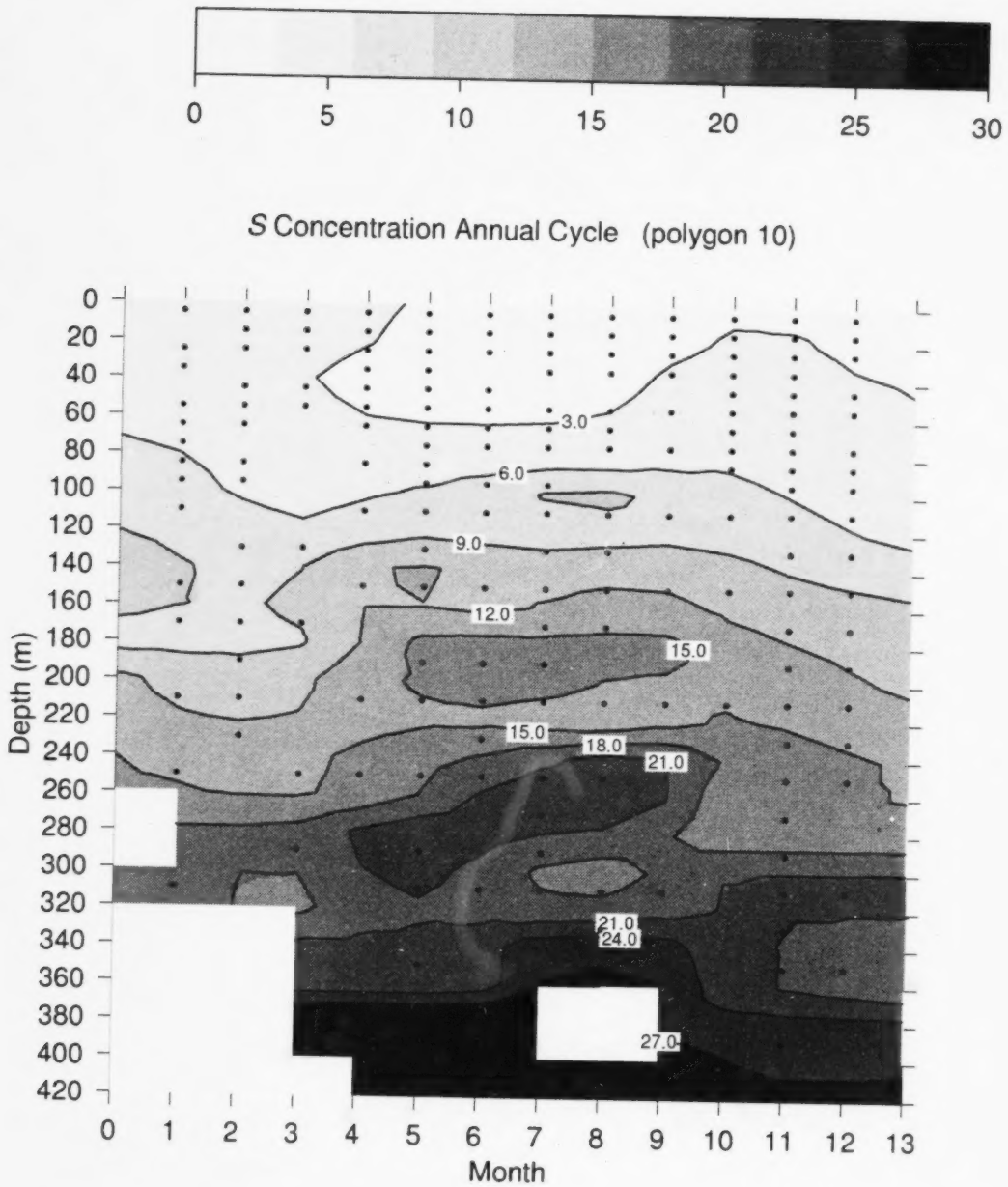

Figure 69: Annual cycle of average silicate concentration (μM) for polygon 10.

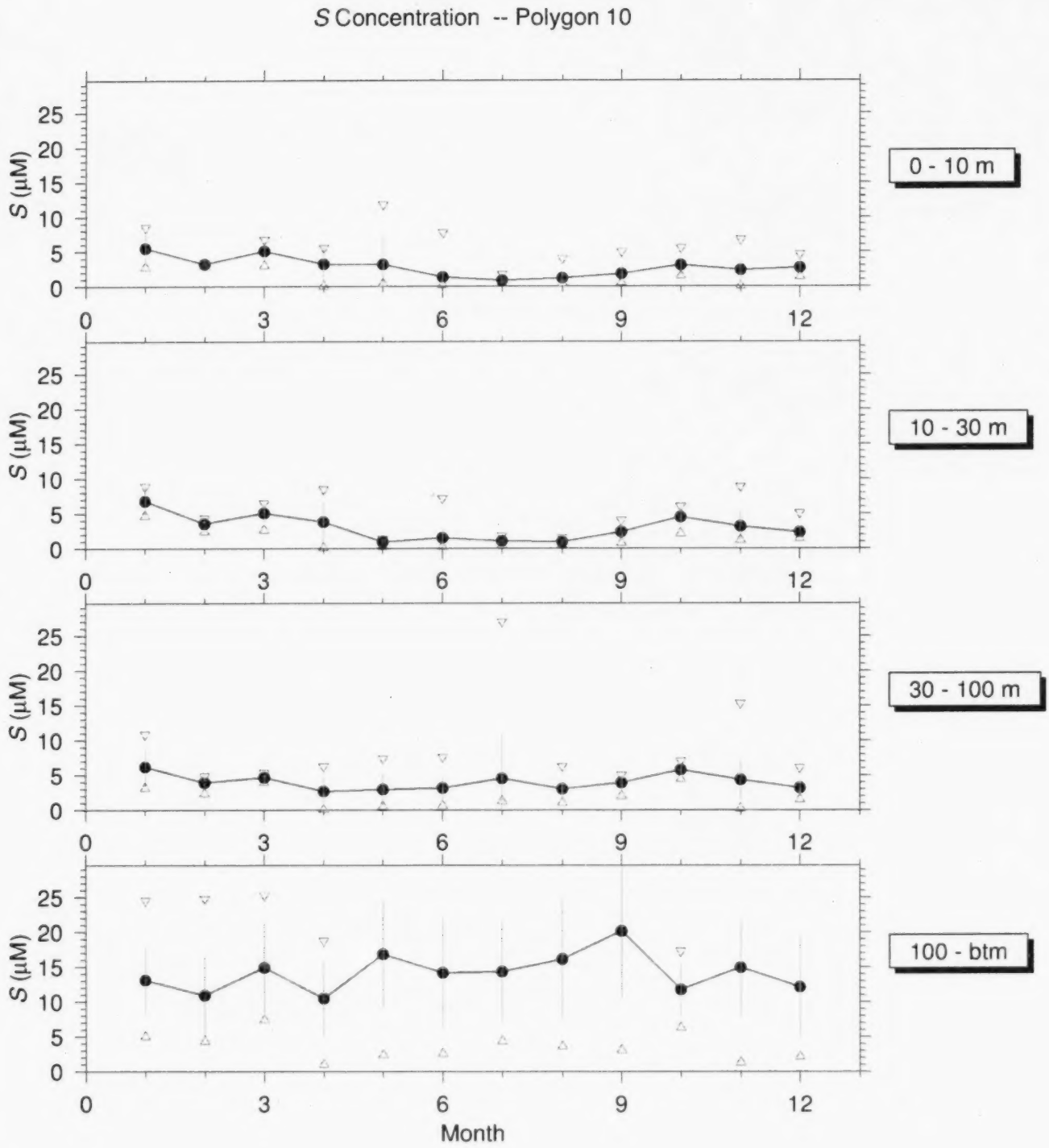

Figure 70: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 10. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

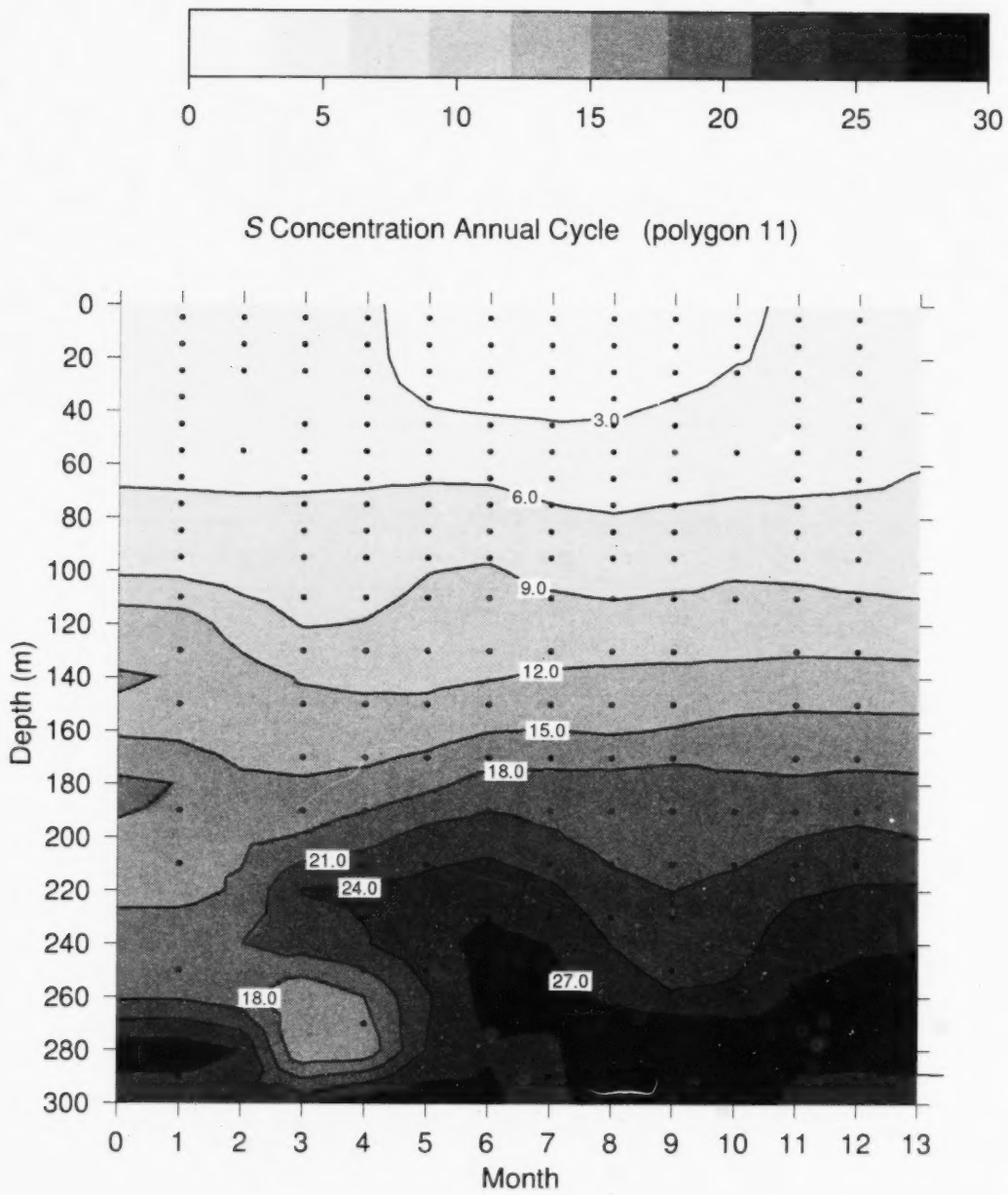

Figure 71: Annual cycle of average silicate concentration (μM) for polygon 11.

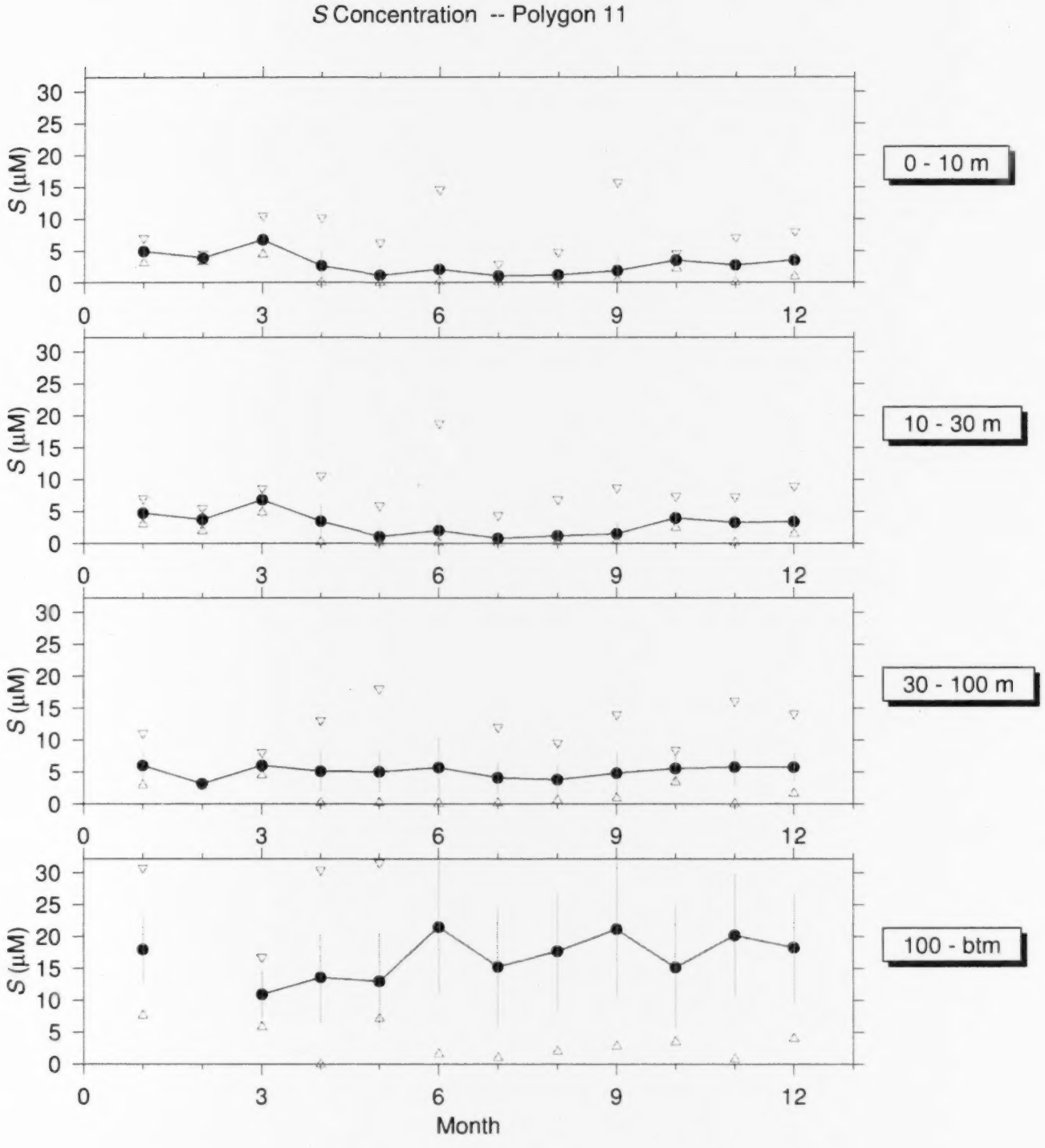

Figure 72: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 11. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

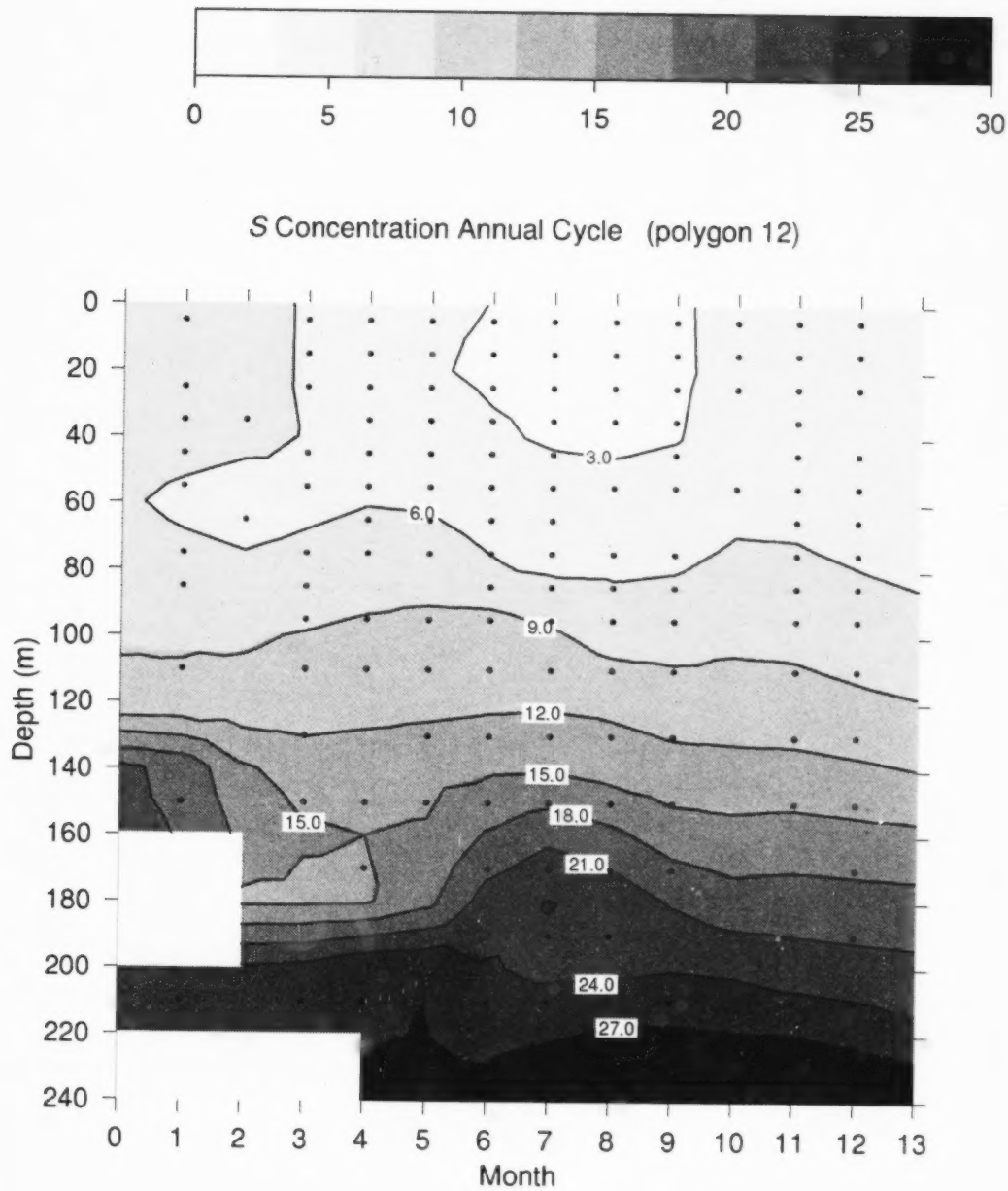

Figure 73: Annual cycle of average silicate concentration (μM) for polygon 12.

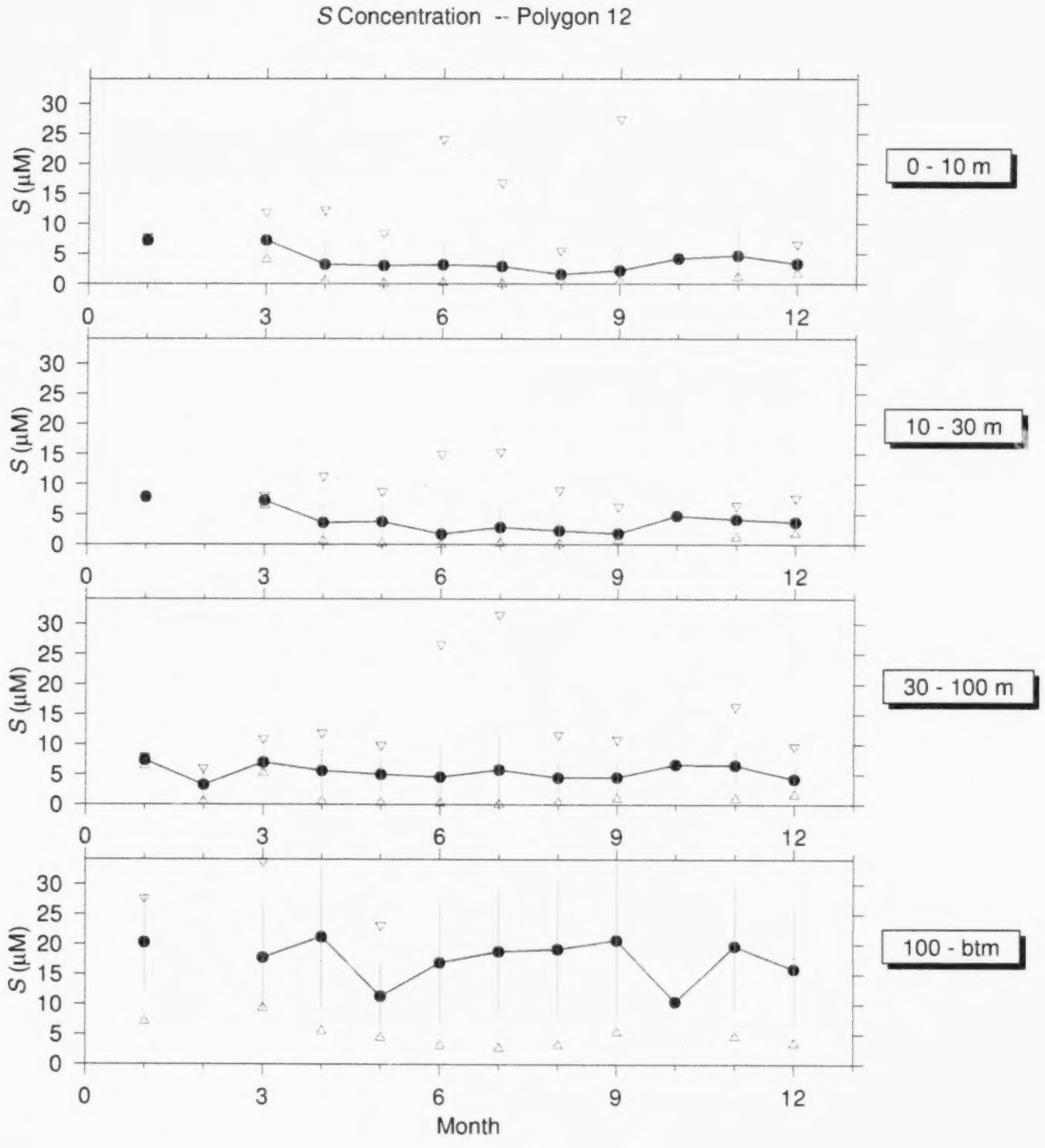

Figure 74: Timeseries of average silicate concentration (μM) for four depth intervals for polygon 12. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

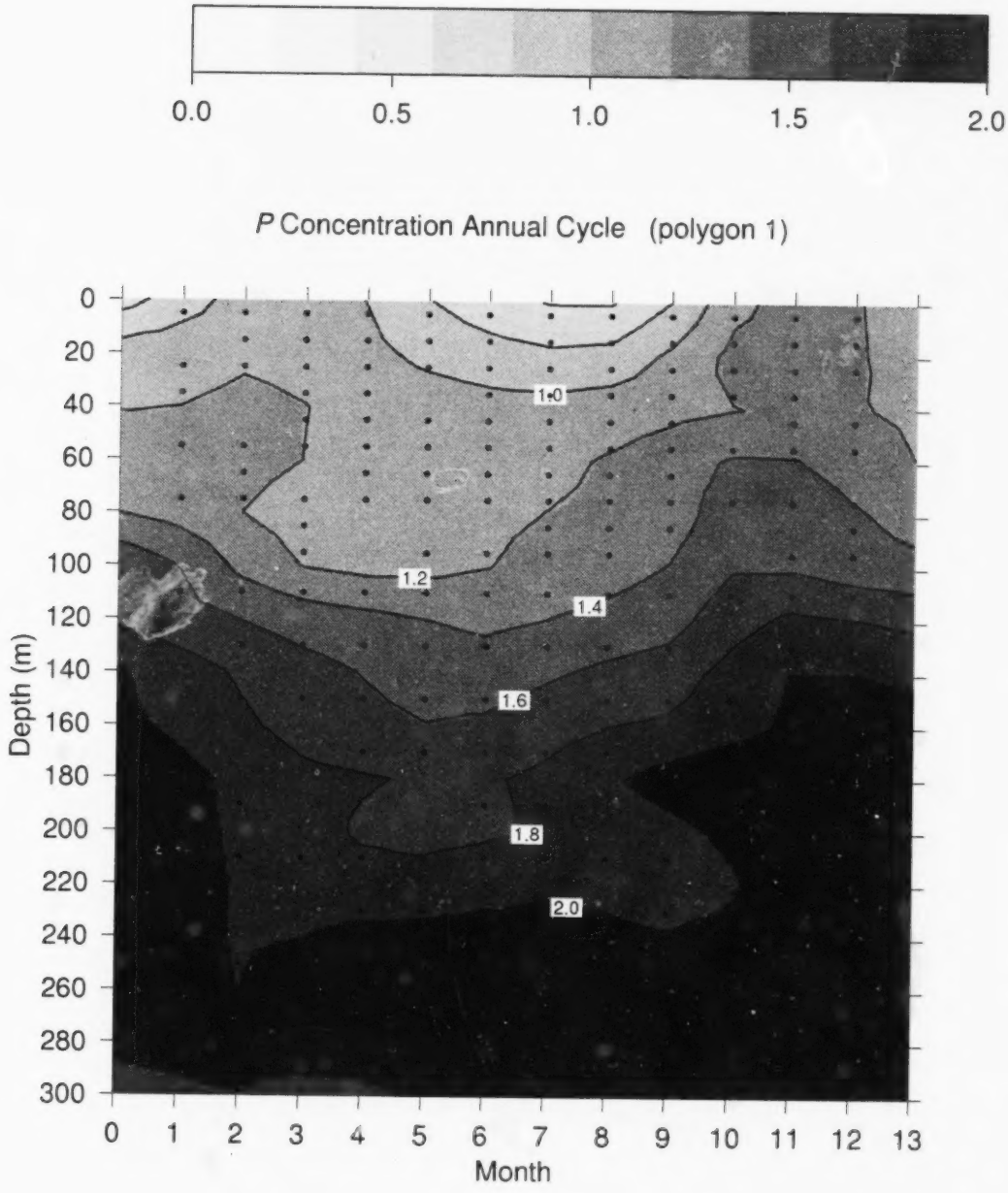

Figure 75: Annual cycle of average phosphate concentration (μM) for polygon 1.

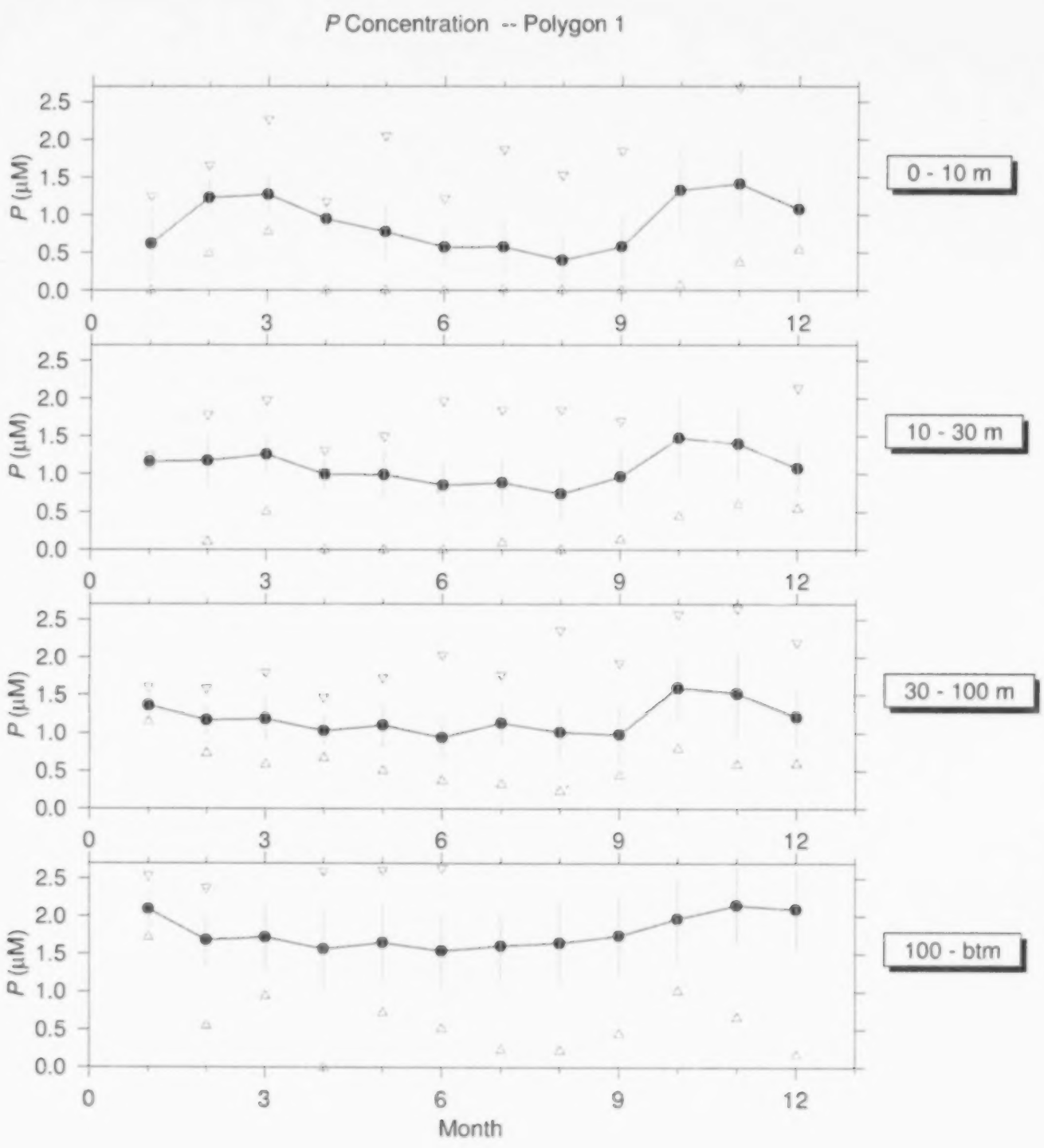

Figure 76: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 1. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

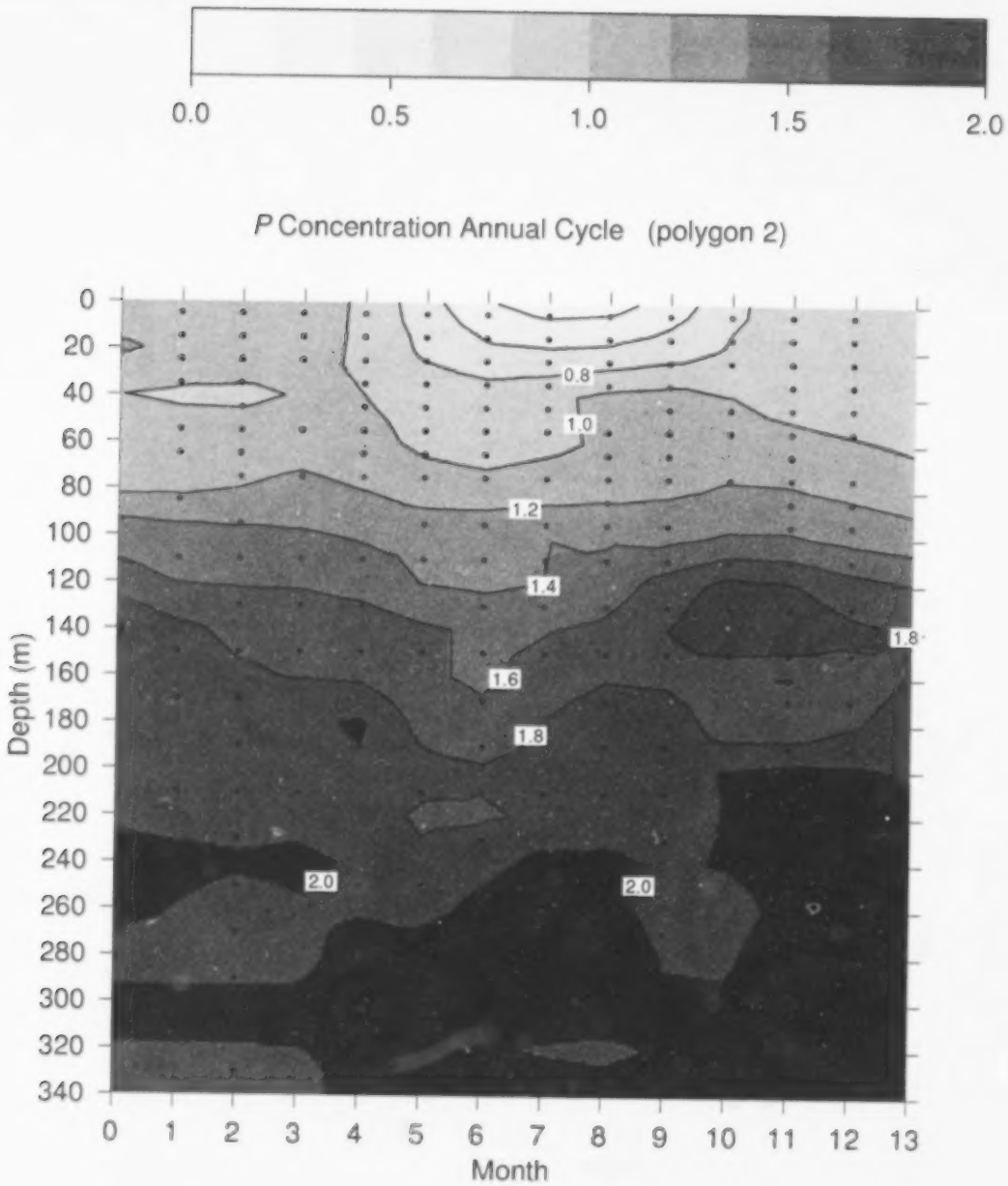

Figure 77: Annual cycle of average phosphate concentration (μM) for polygon 2.

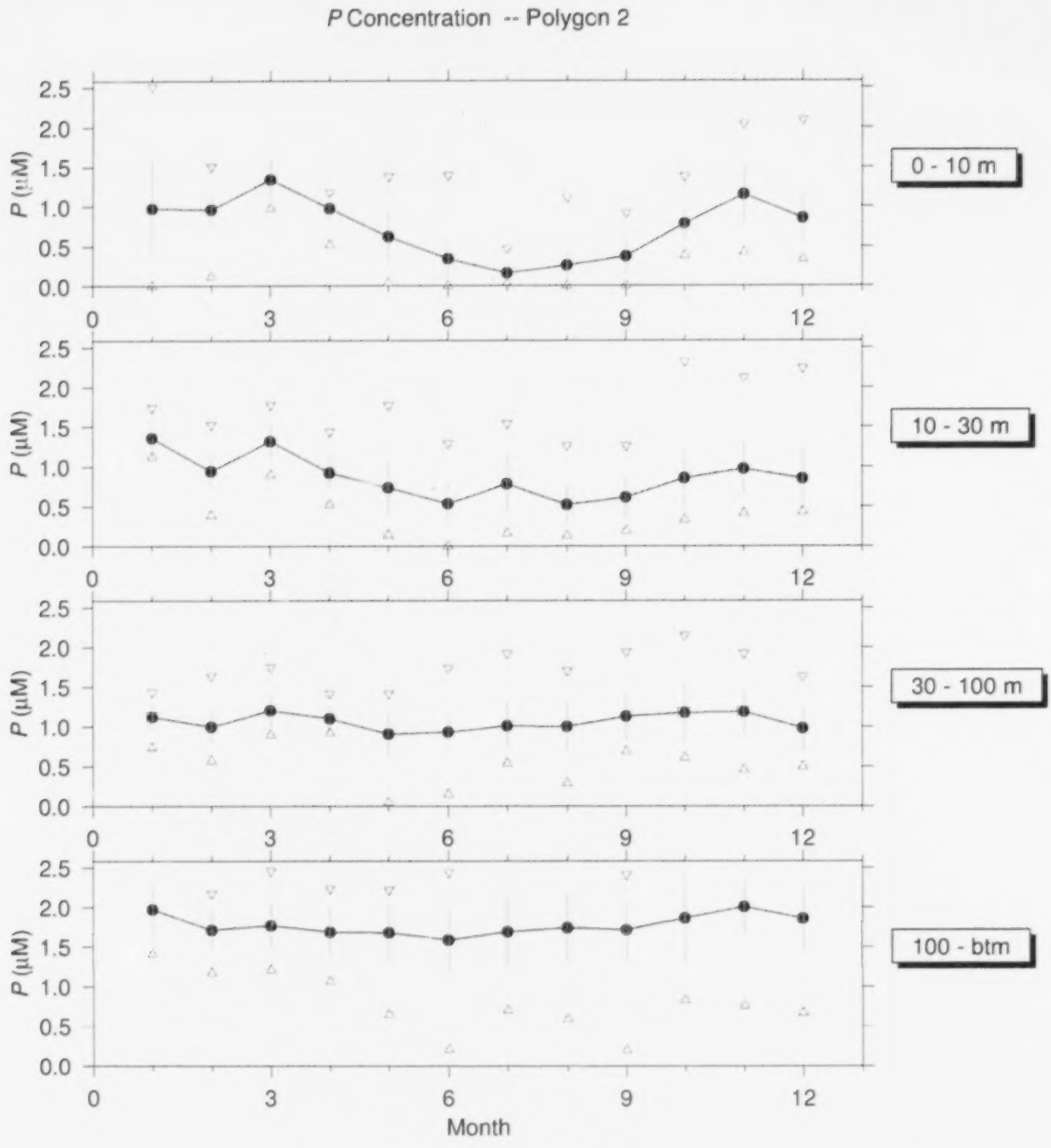

Figure 78: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 2. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

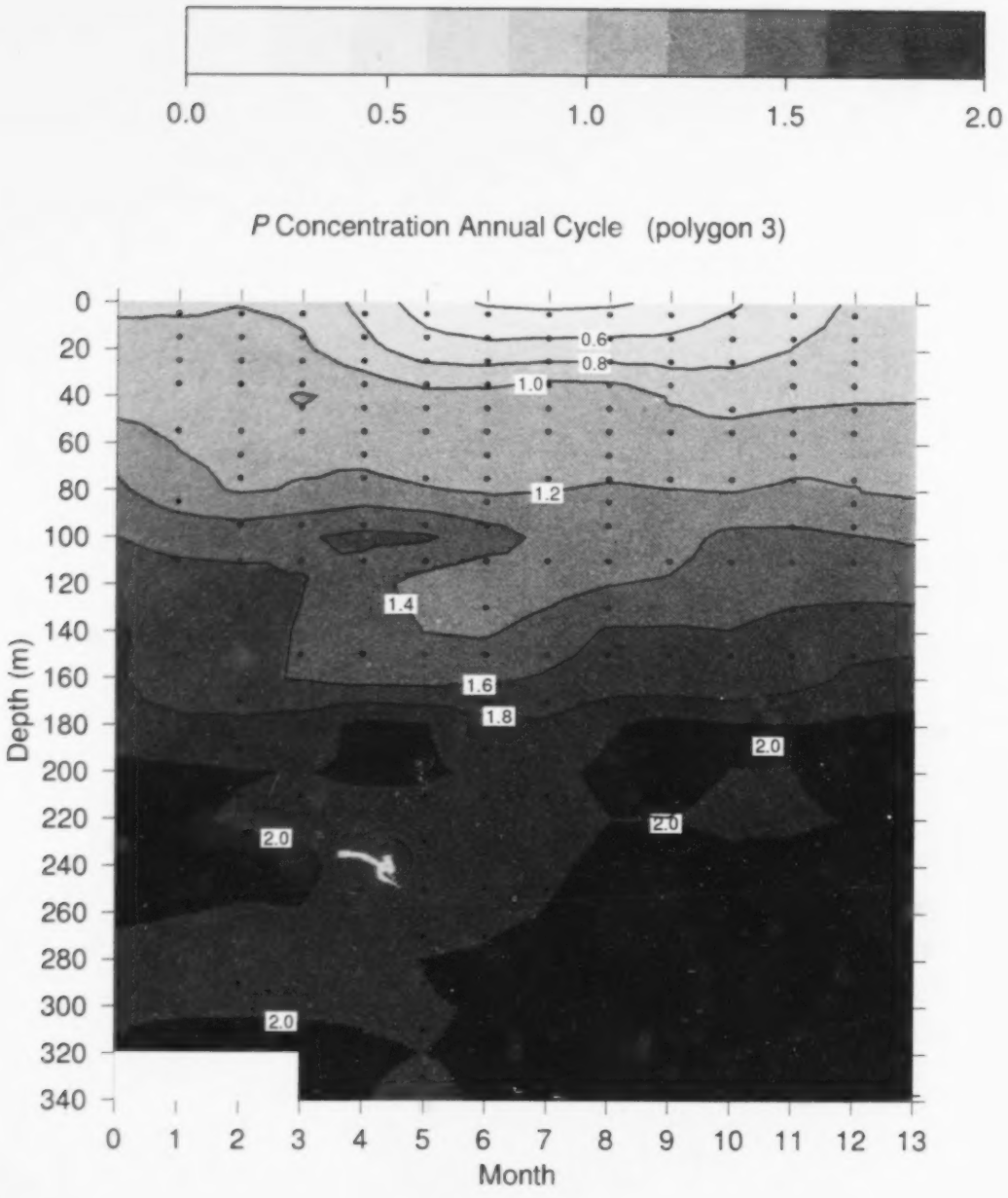

Figure 79: Annual cycle of average phosphate concentration (μM) for polygon 3.

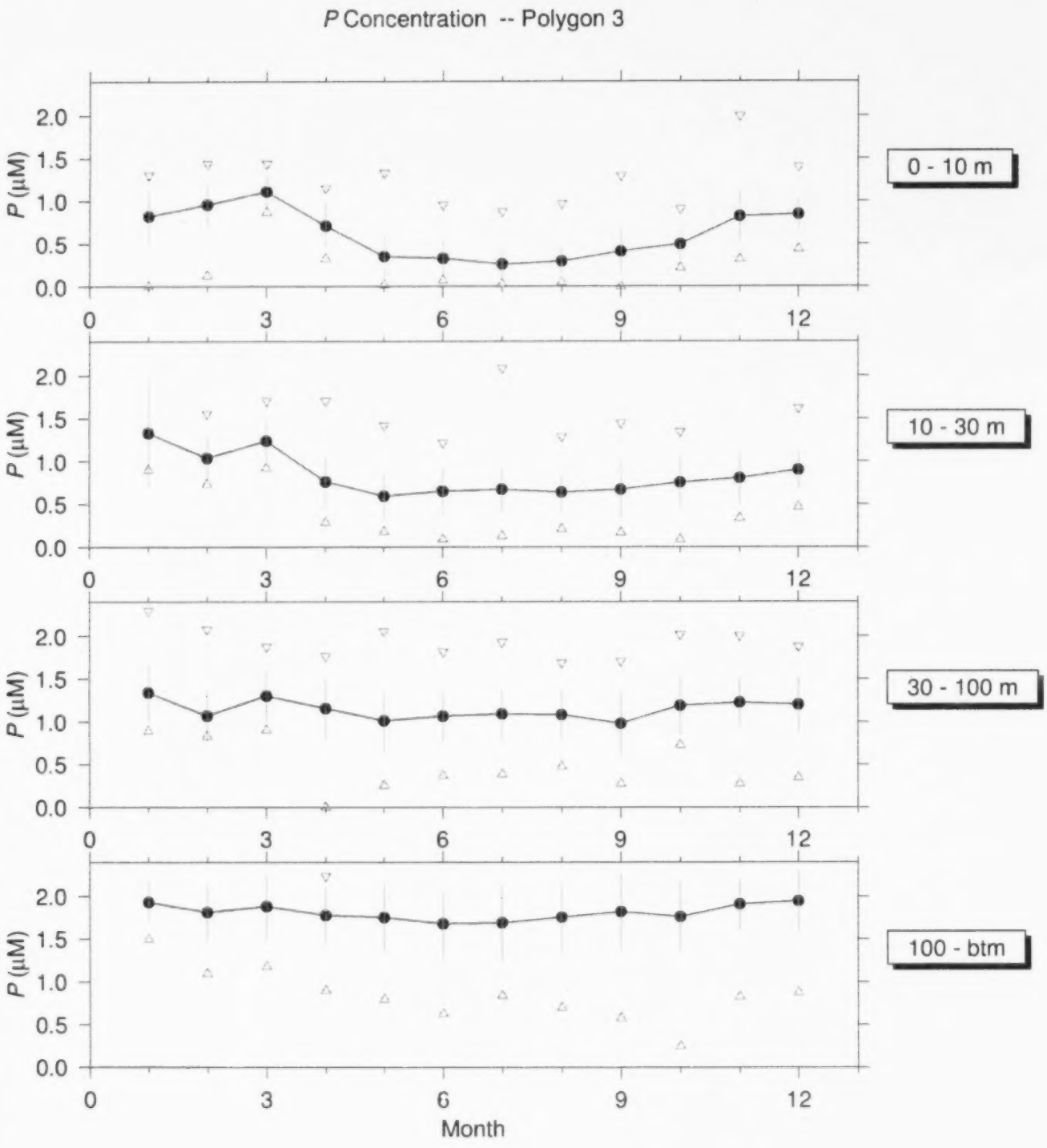

Figure 80: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 3. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

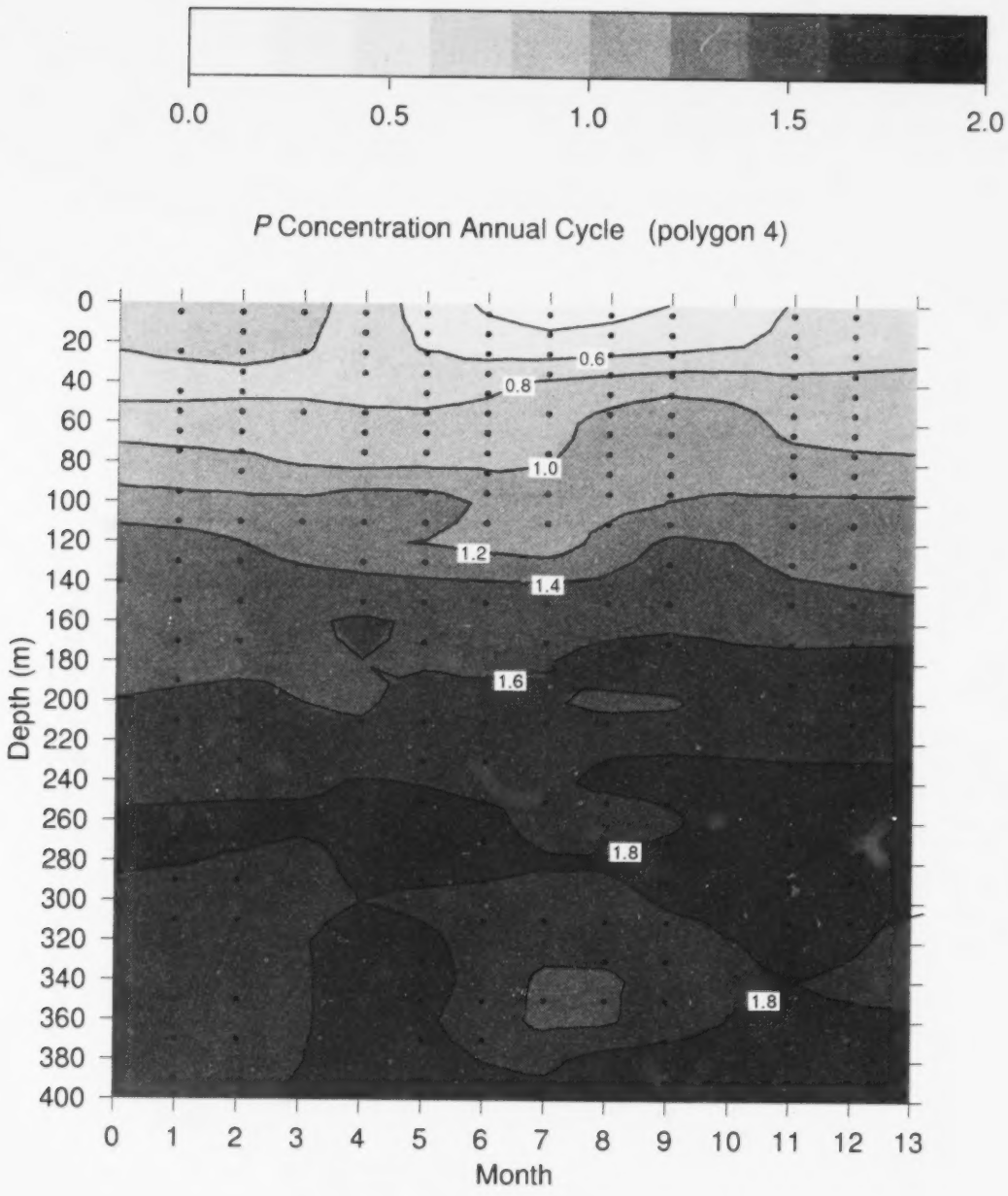

Figure 81: Annual cycle of average phosphate concentration (μM) for polygon 4.

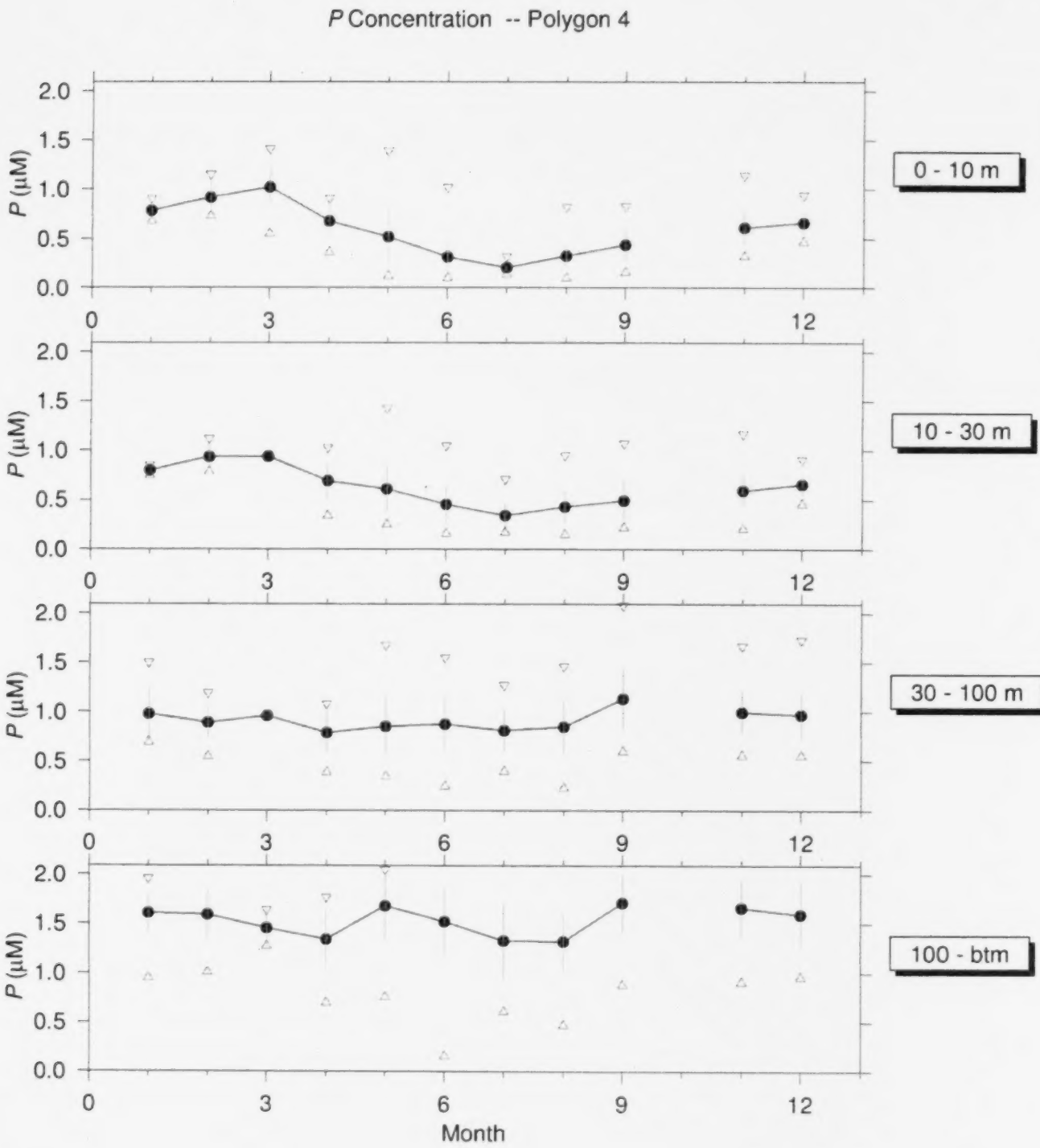

Figure 82: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 4. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

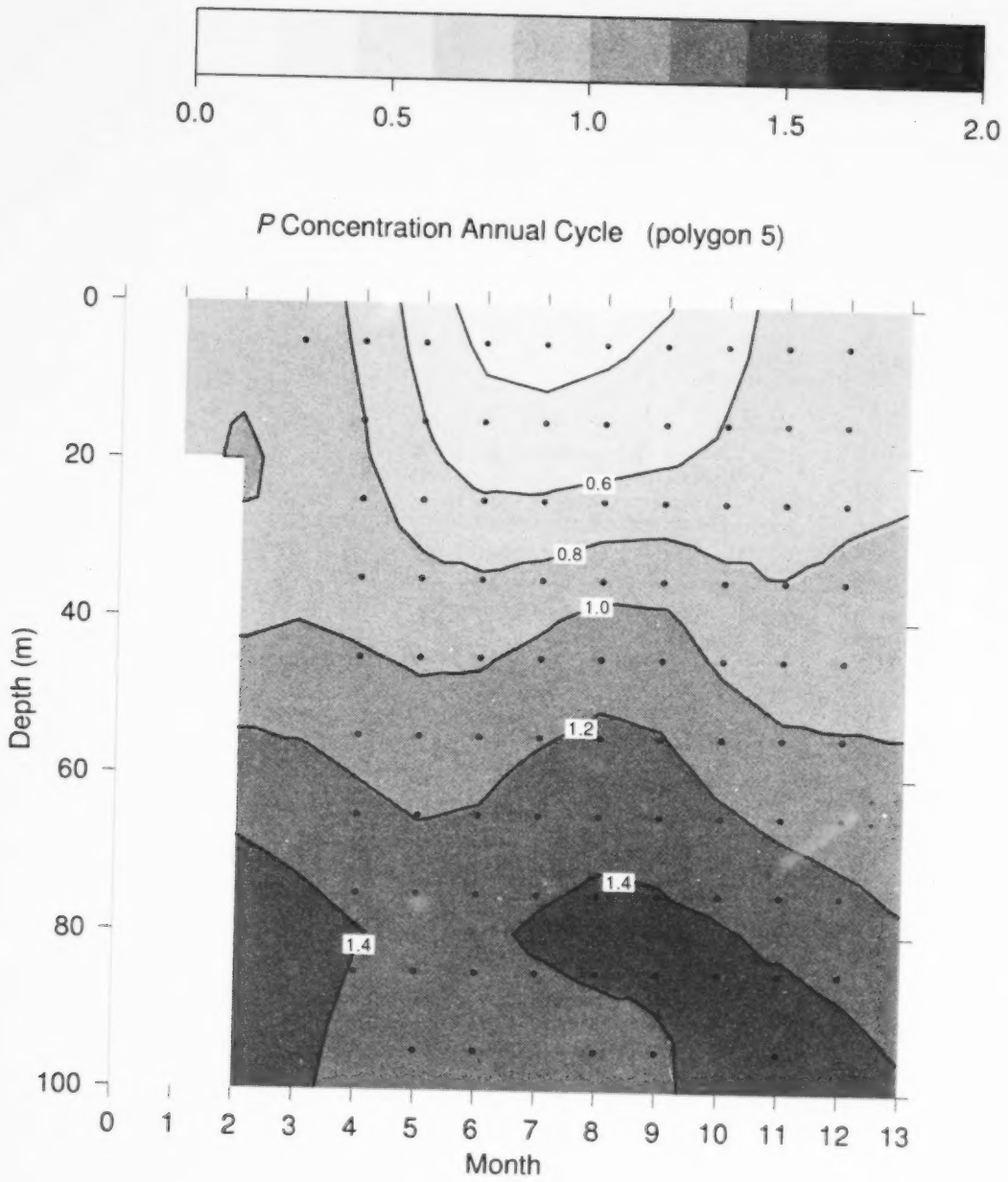

Figure 83: Annual cycle of average phosphate concentration (μM) for polygon 5.

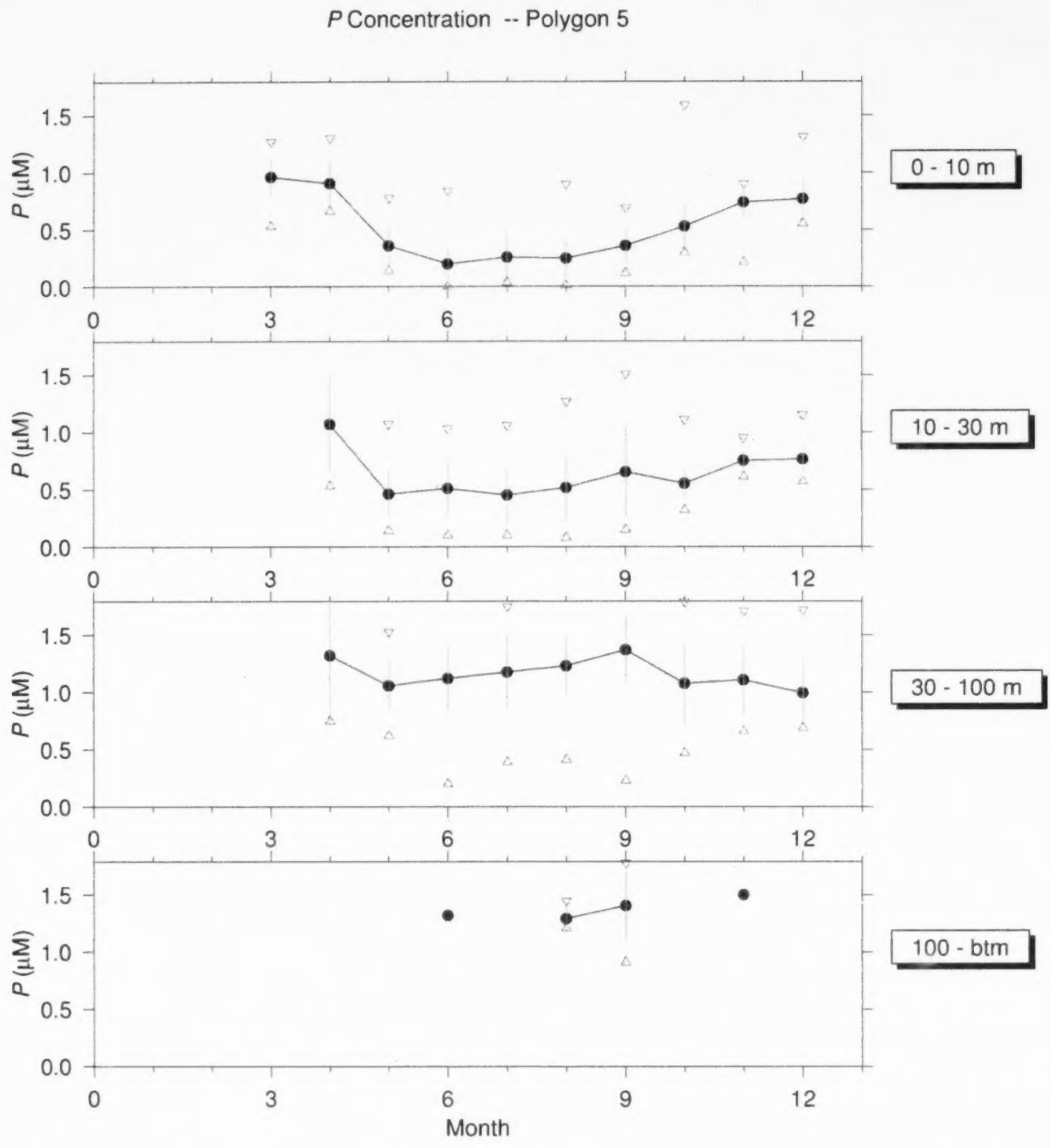

Figure 84: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 5. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

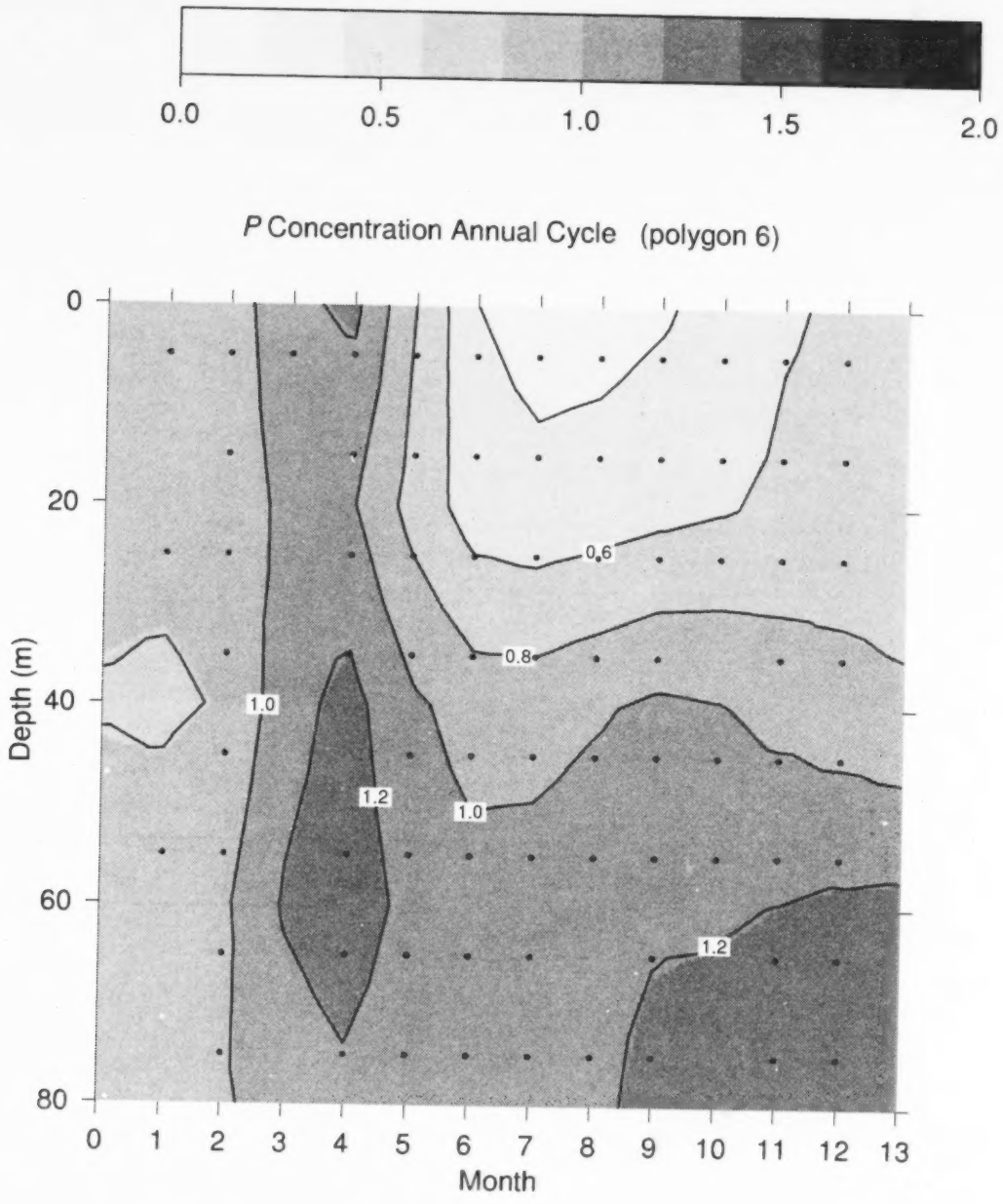

Figure 85: Annual cycle of average phosphate concentration (μM) for polygon 6.

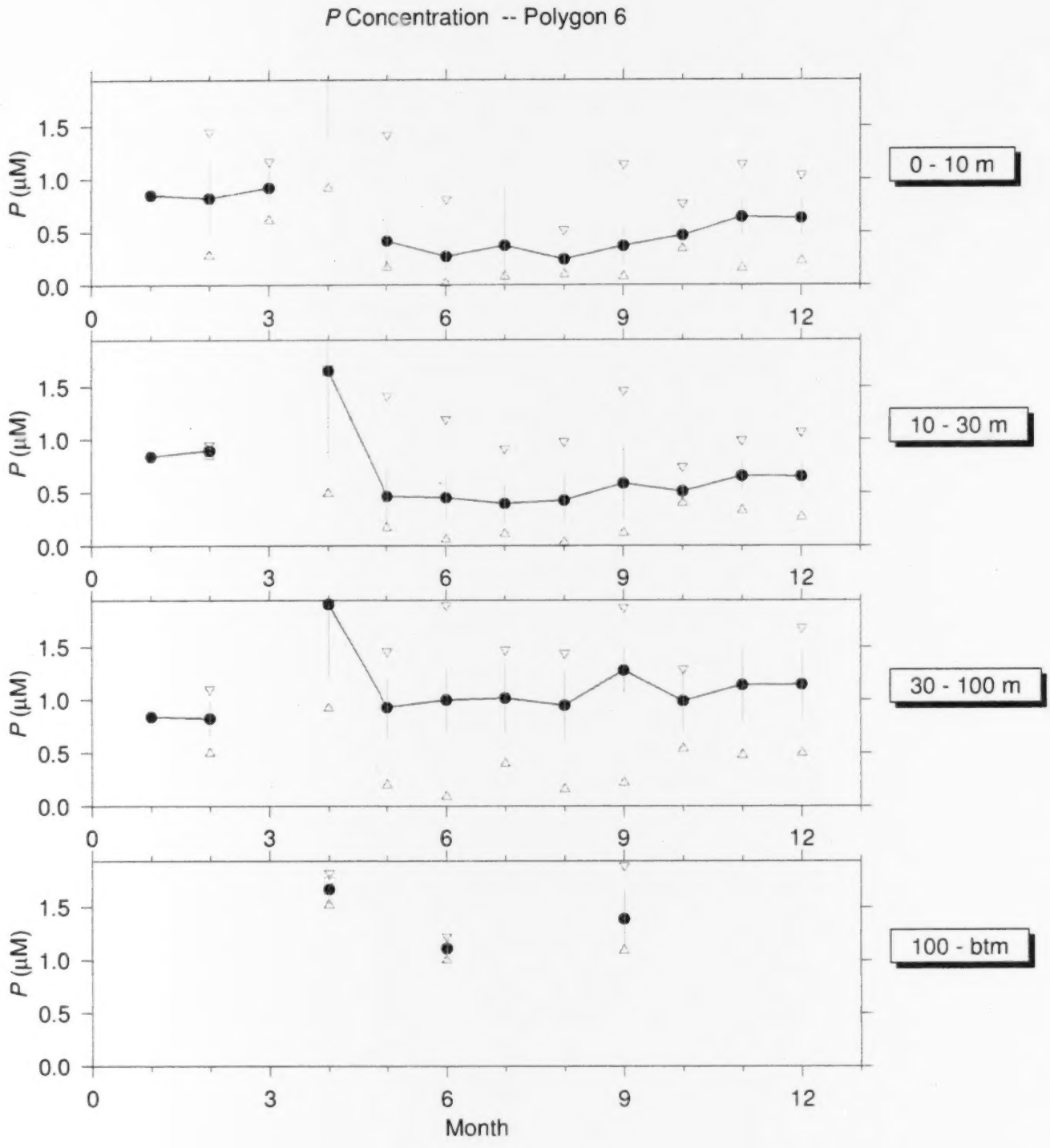

Figure 86: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 6. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

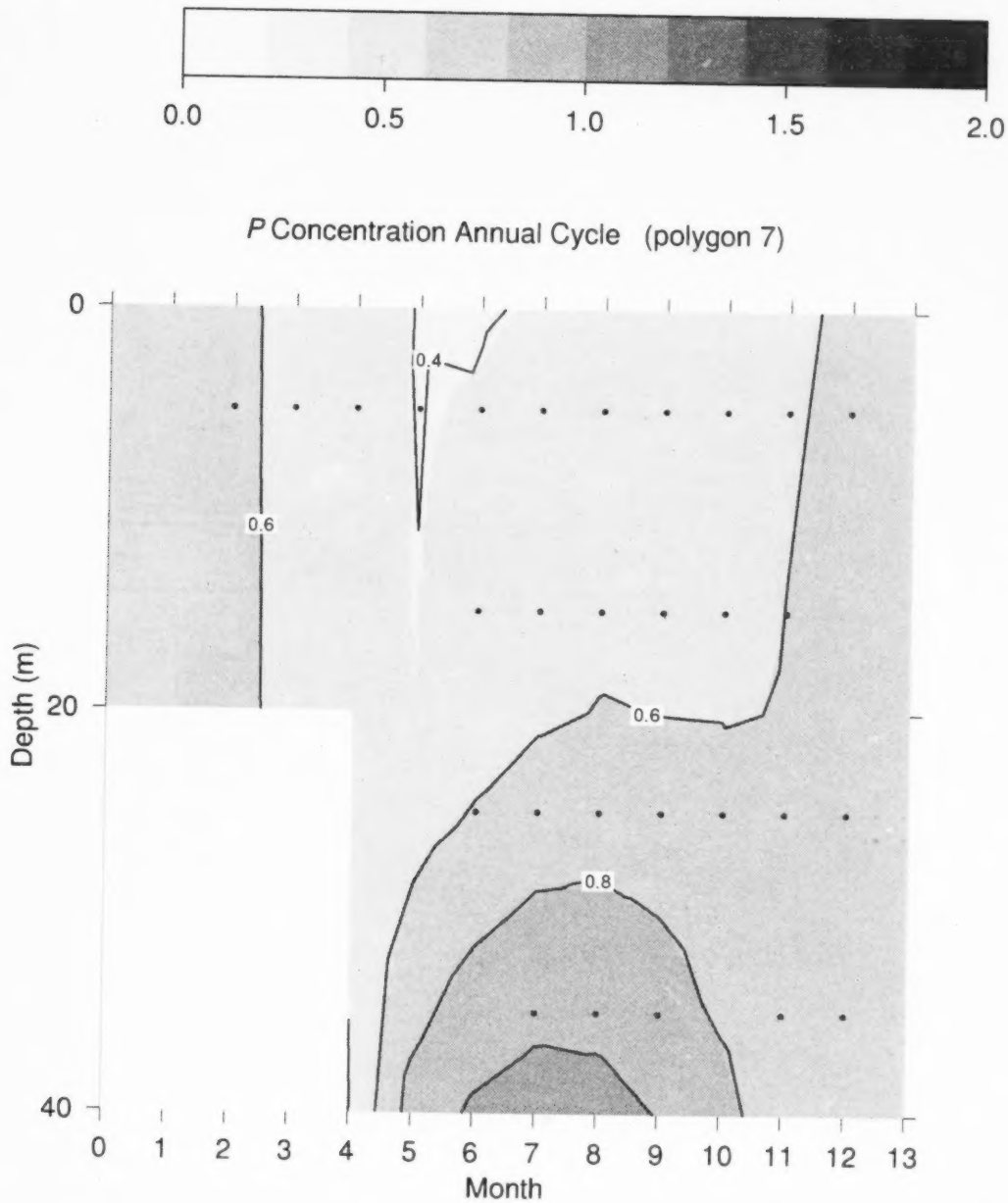

Figure 87: Annual cycle of average phosphate concentration (μM) for polygon 7.

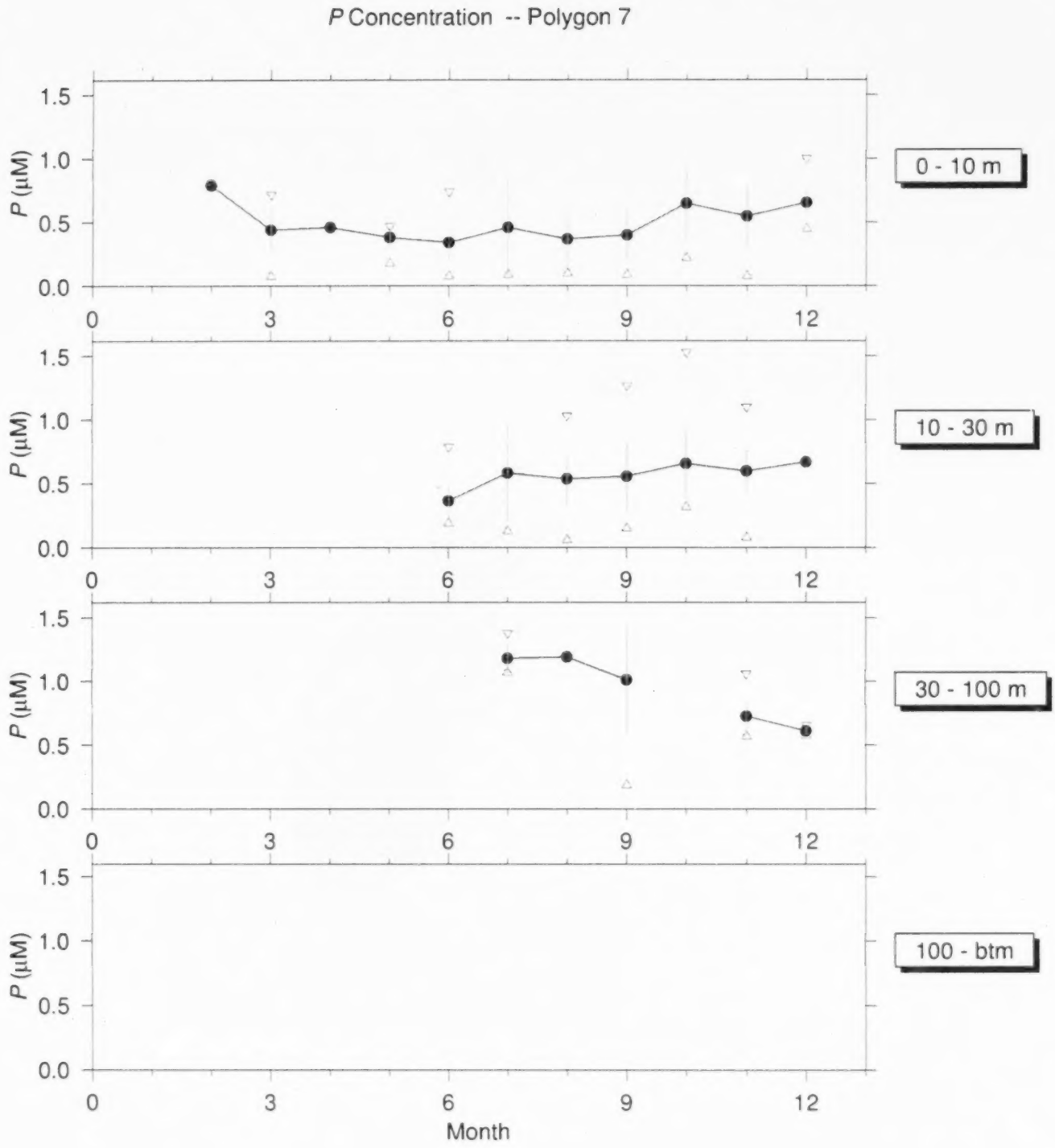

Figure 88: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 7. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

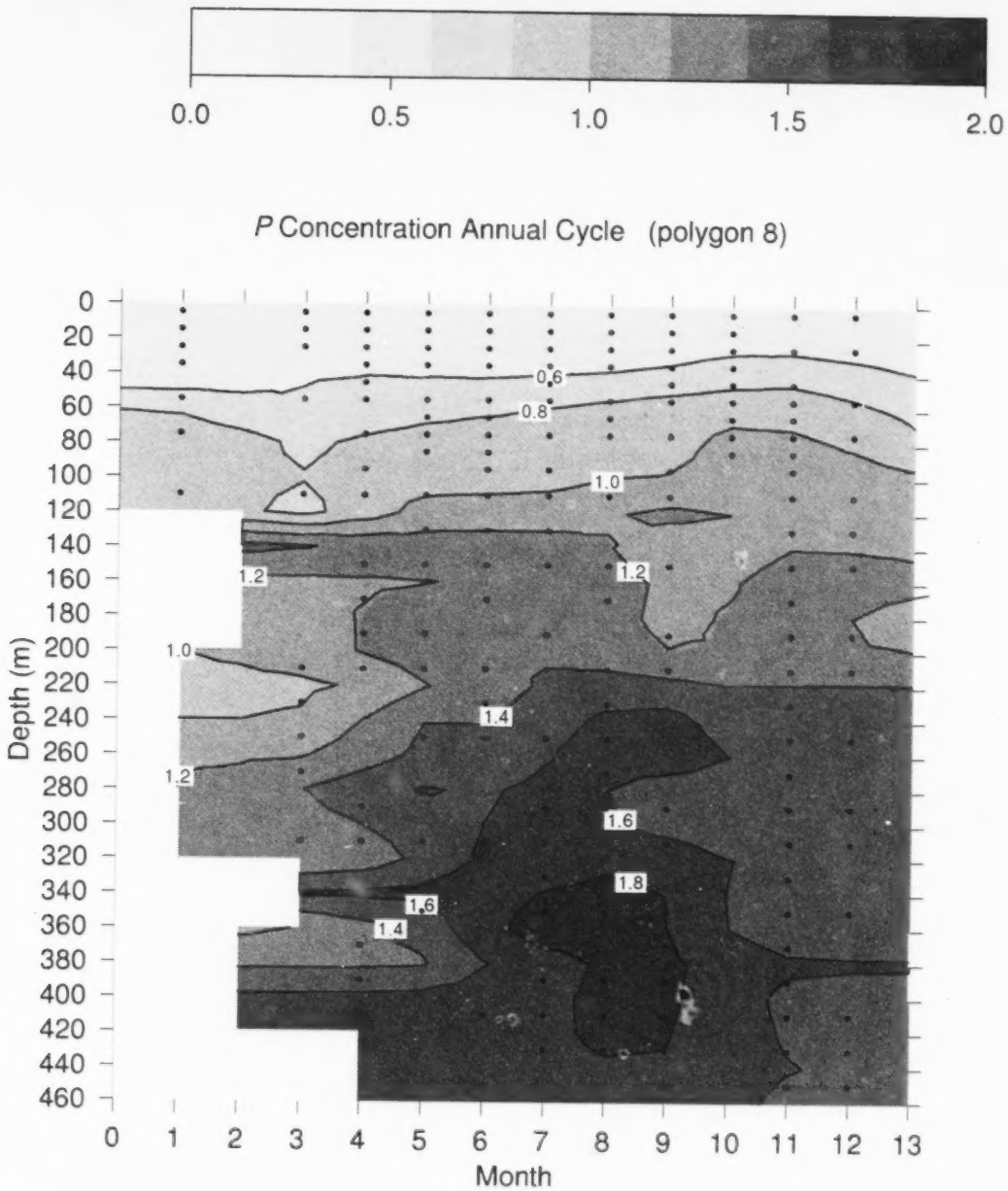

Figure 89: Annual cycle of average phosphate concentration (μM) for polygon 8.

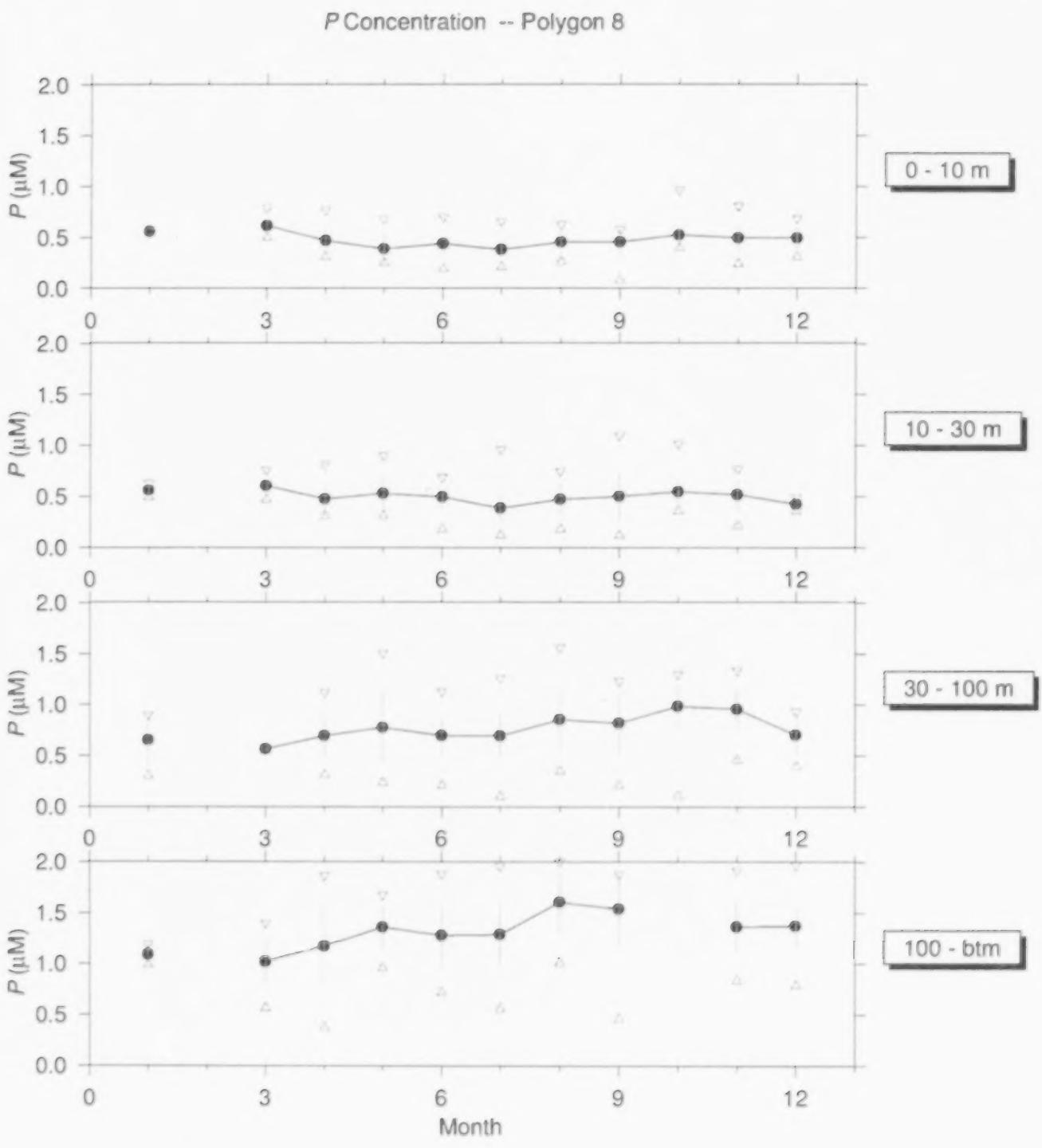

Figure 90: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 8. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

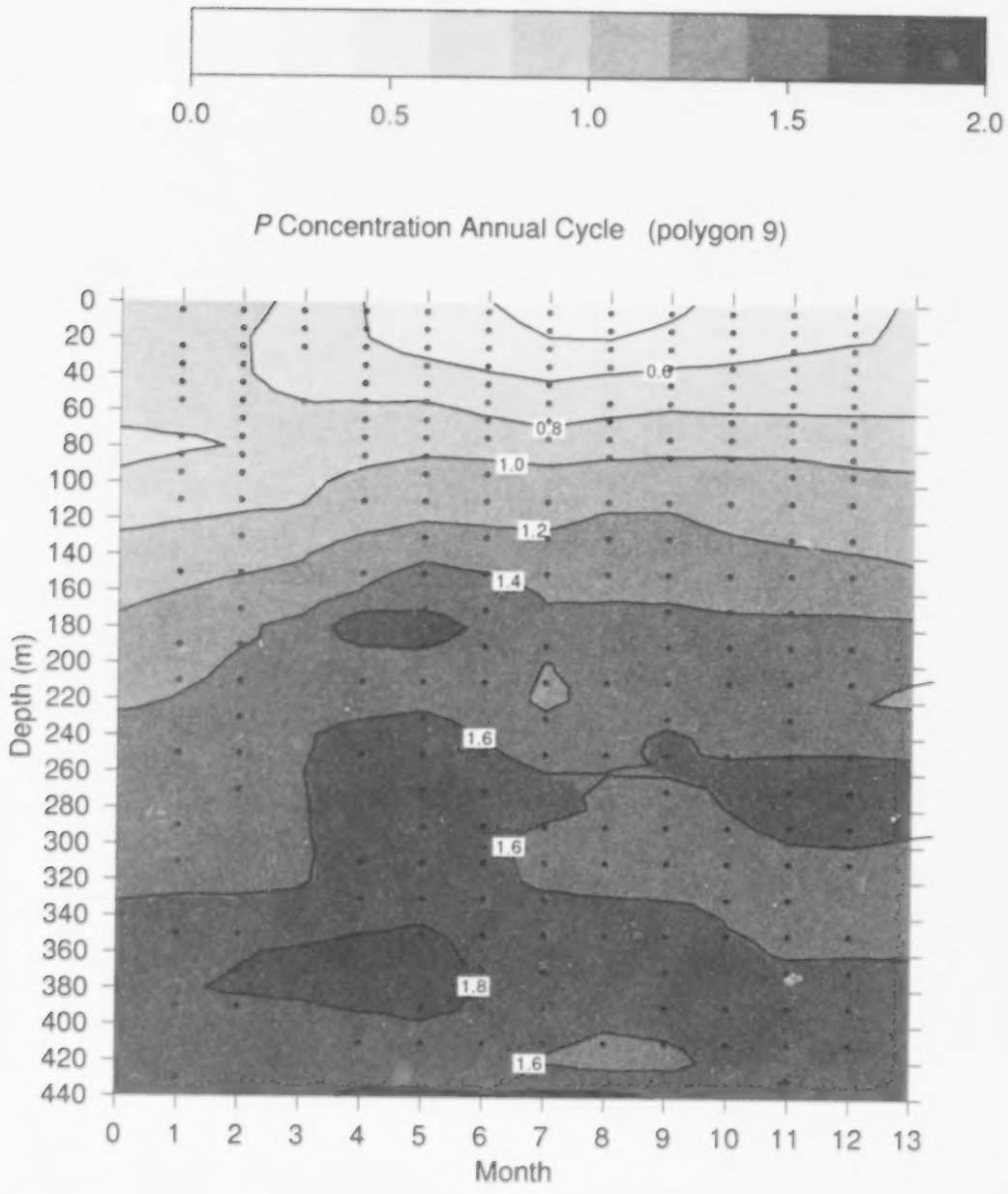

Figure 91: Annual cycle of average phosphate concentration (μM) for polygon 9.

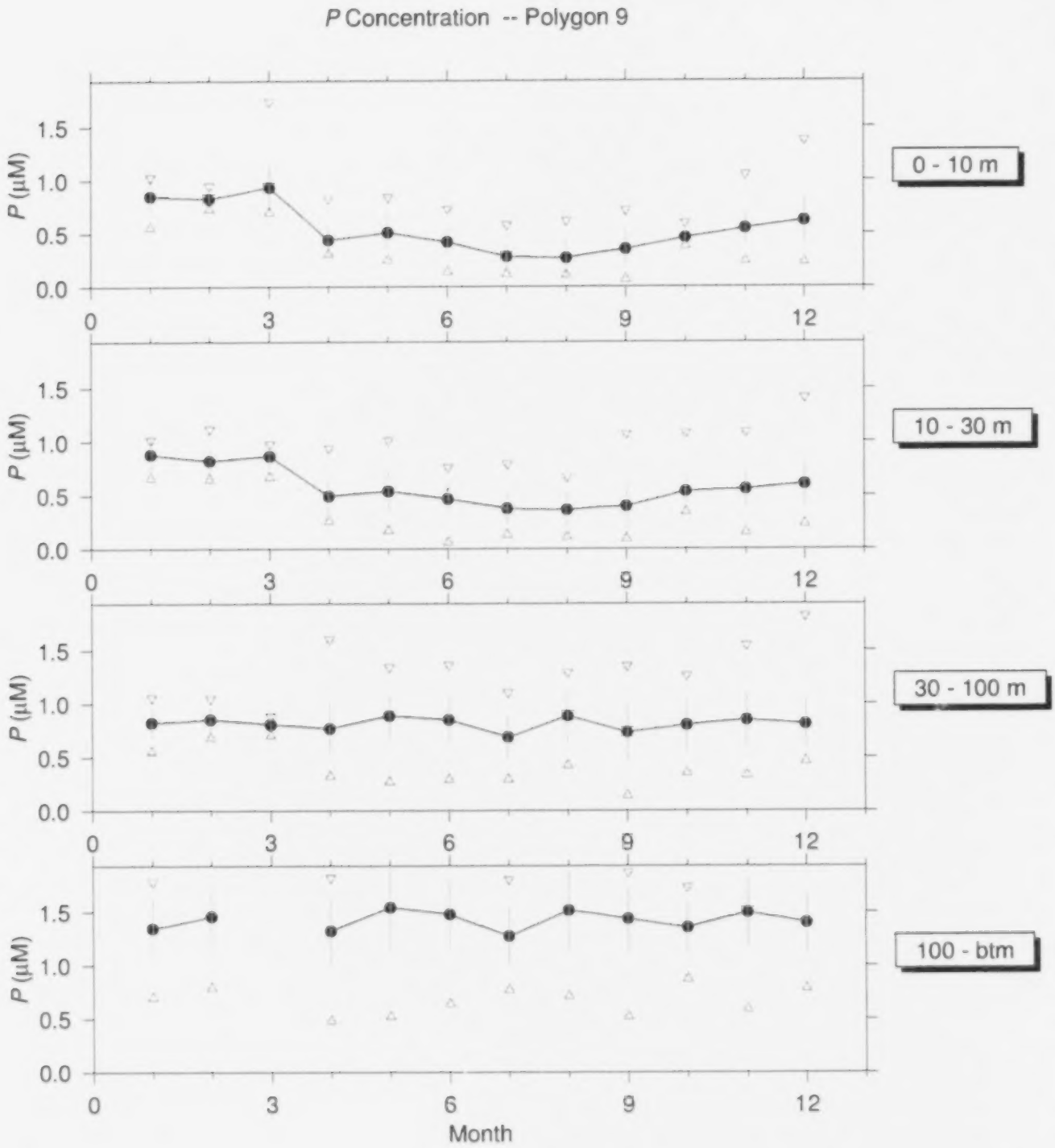

Figure 92: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 9. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

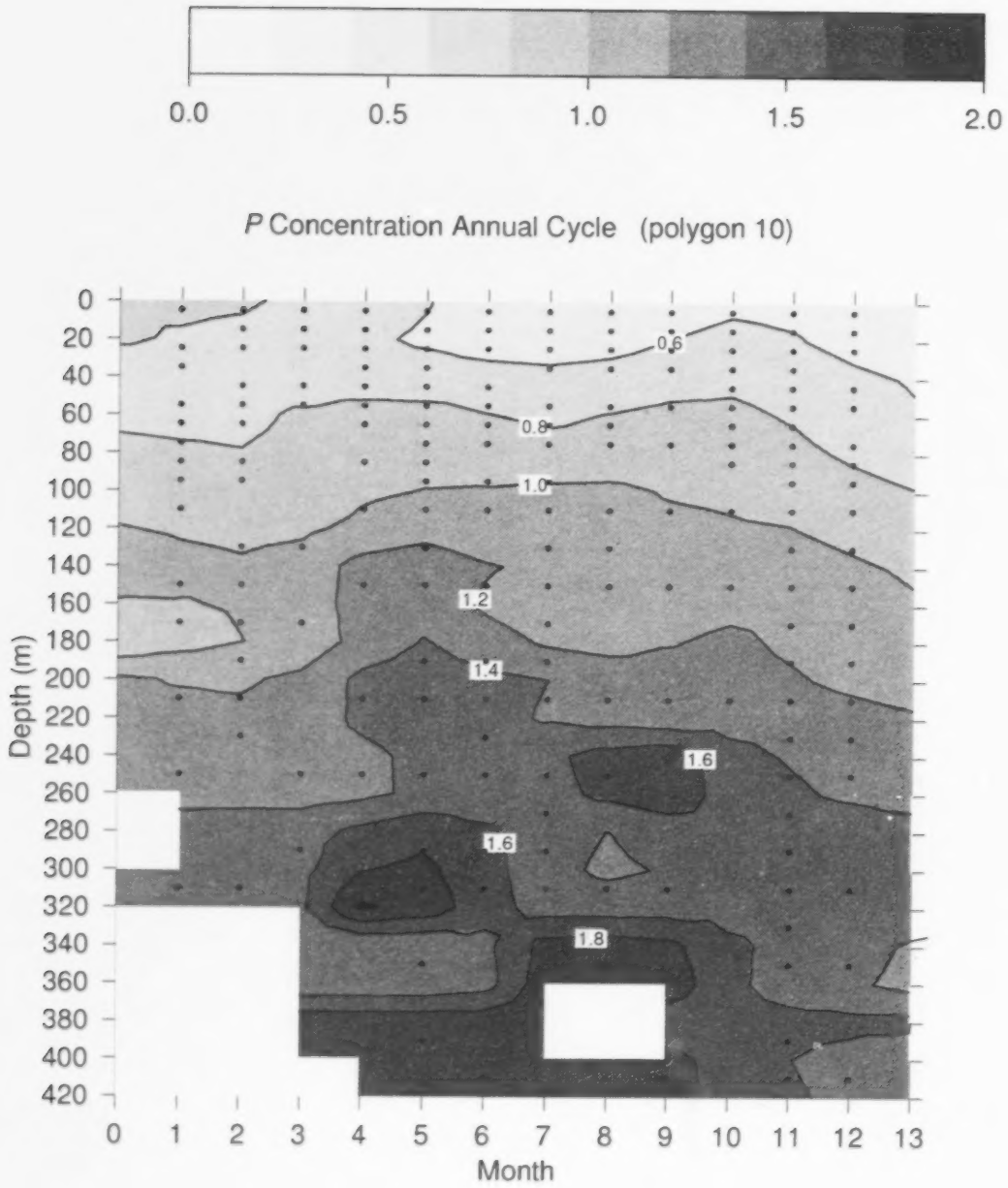

Figure 93: Annual cycle of average phosphate concentration (μM) for polygon 10.

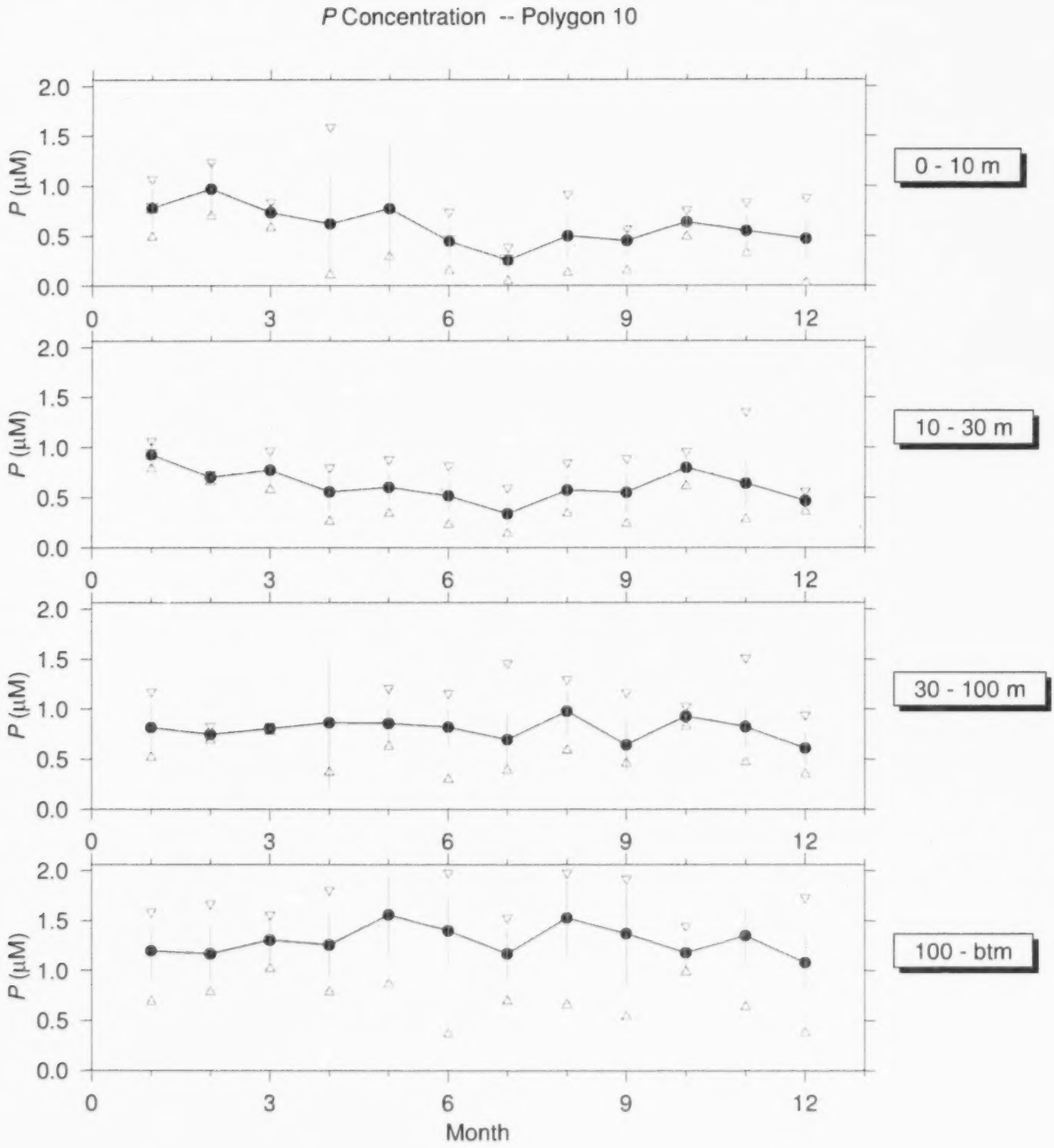

Figure 94: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 10. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

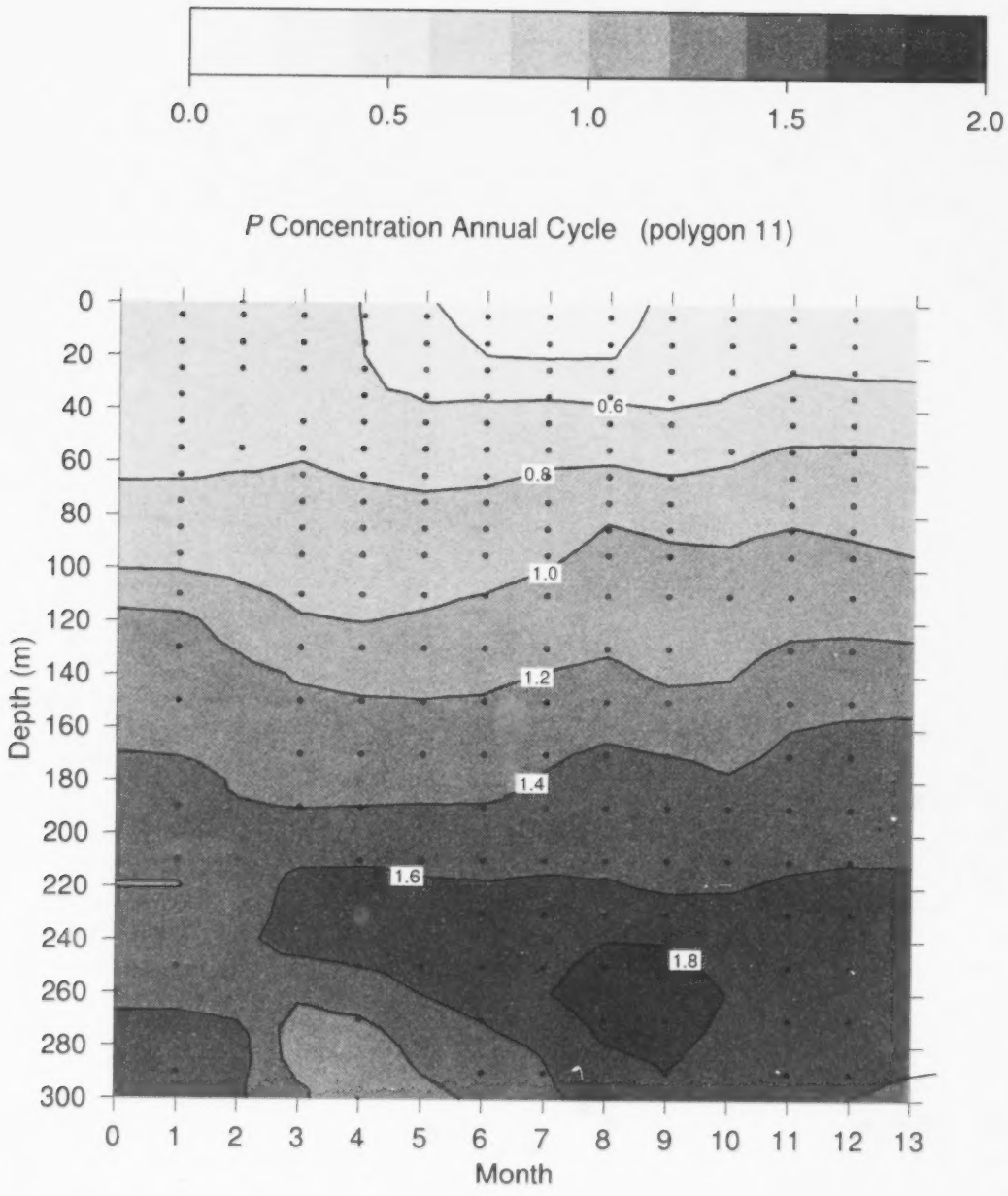

Figure 95: Annual cycle of average phosphate concentration (μM) for polygon 11.

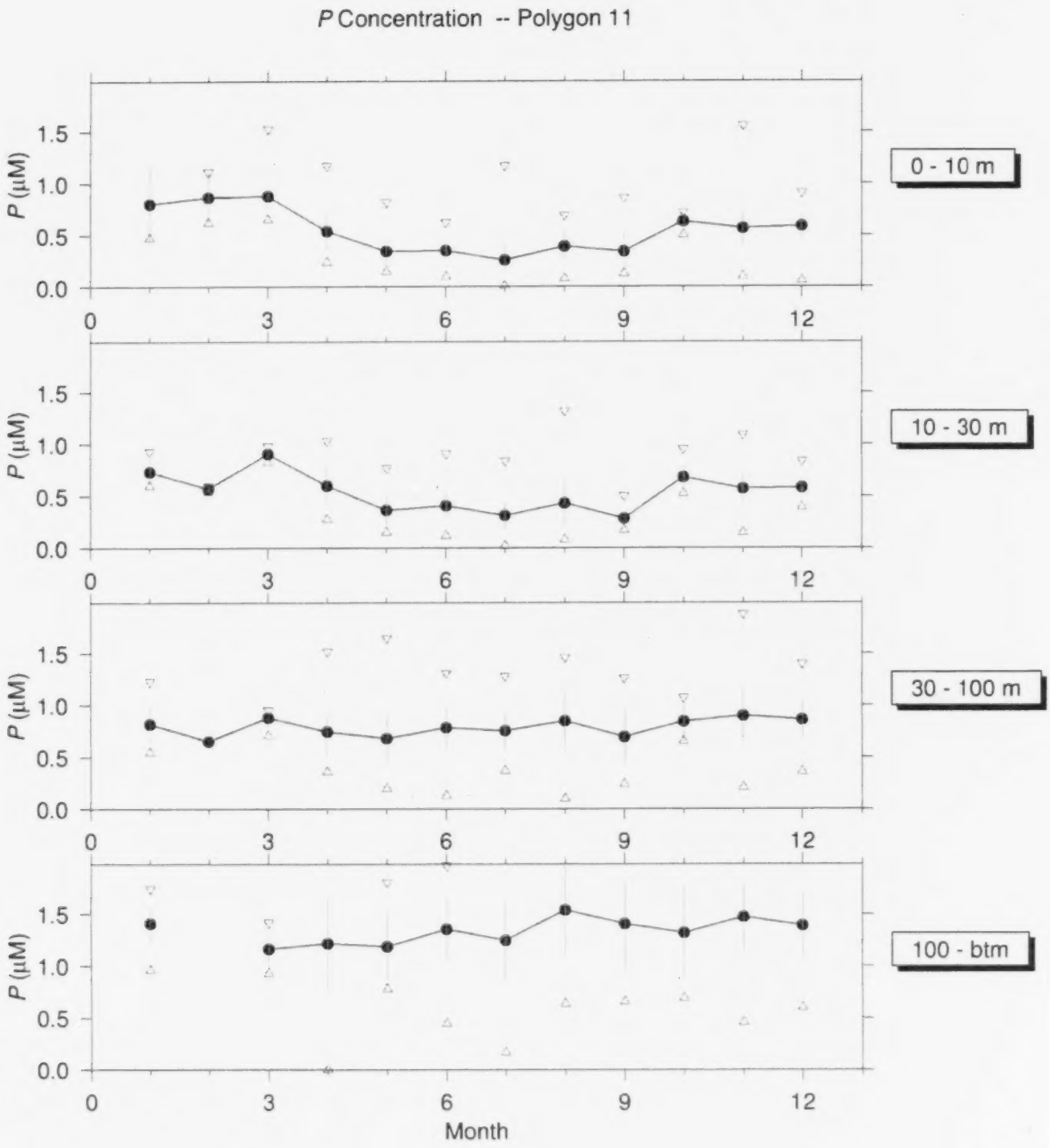

Figure 96: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 11. Vertical lines are $\pm$ 1 s.d.; symbols show the range of values.

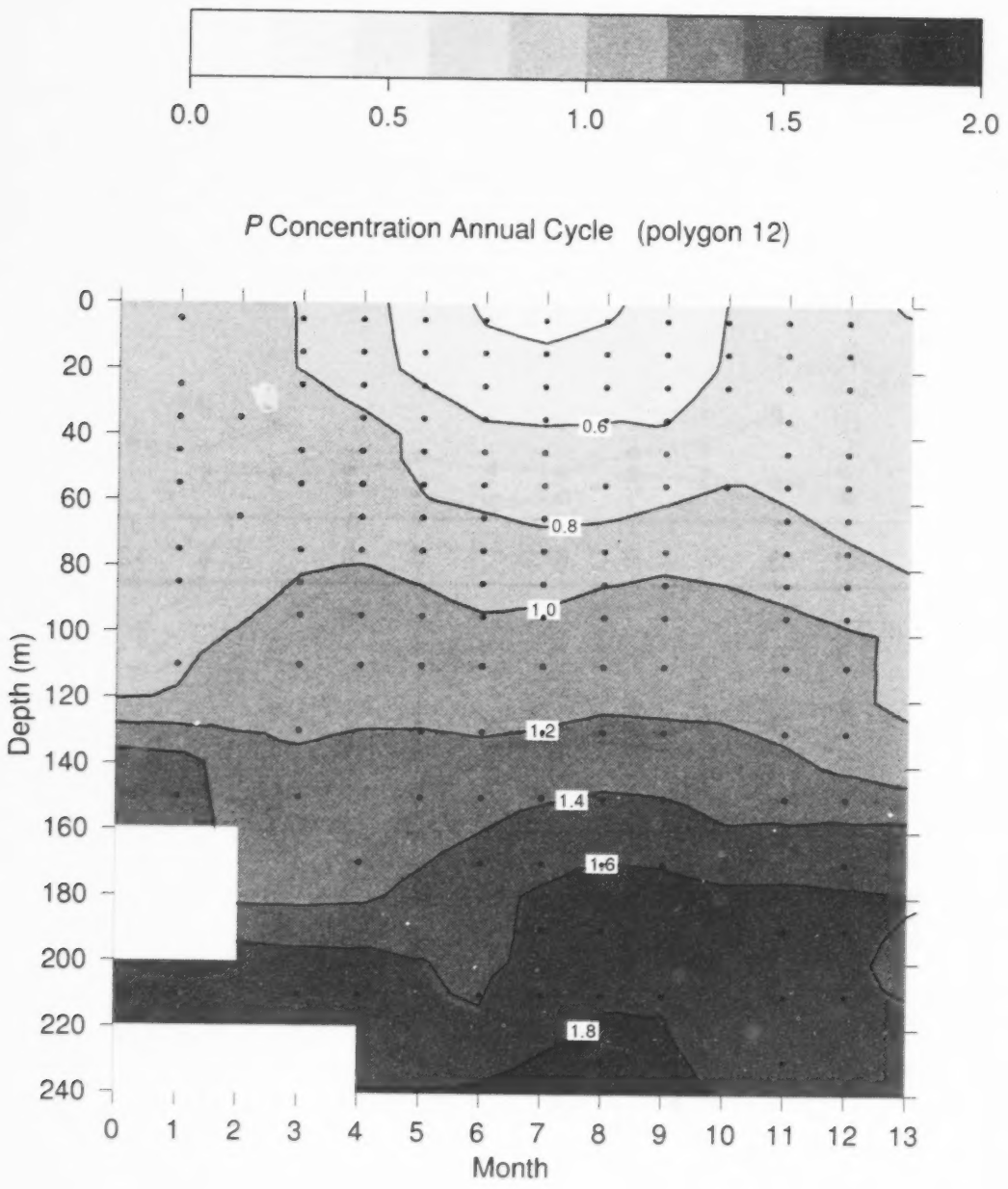

Figure 97: Annual cycle of average phosphate concentration (μM) for polygon 12.

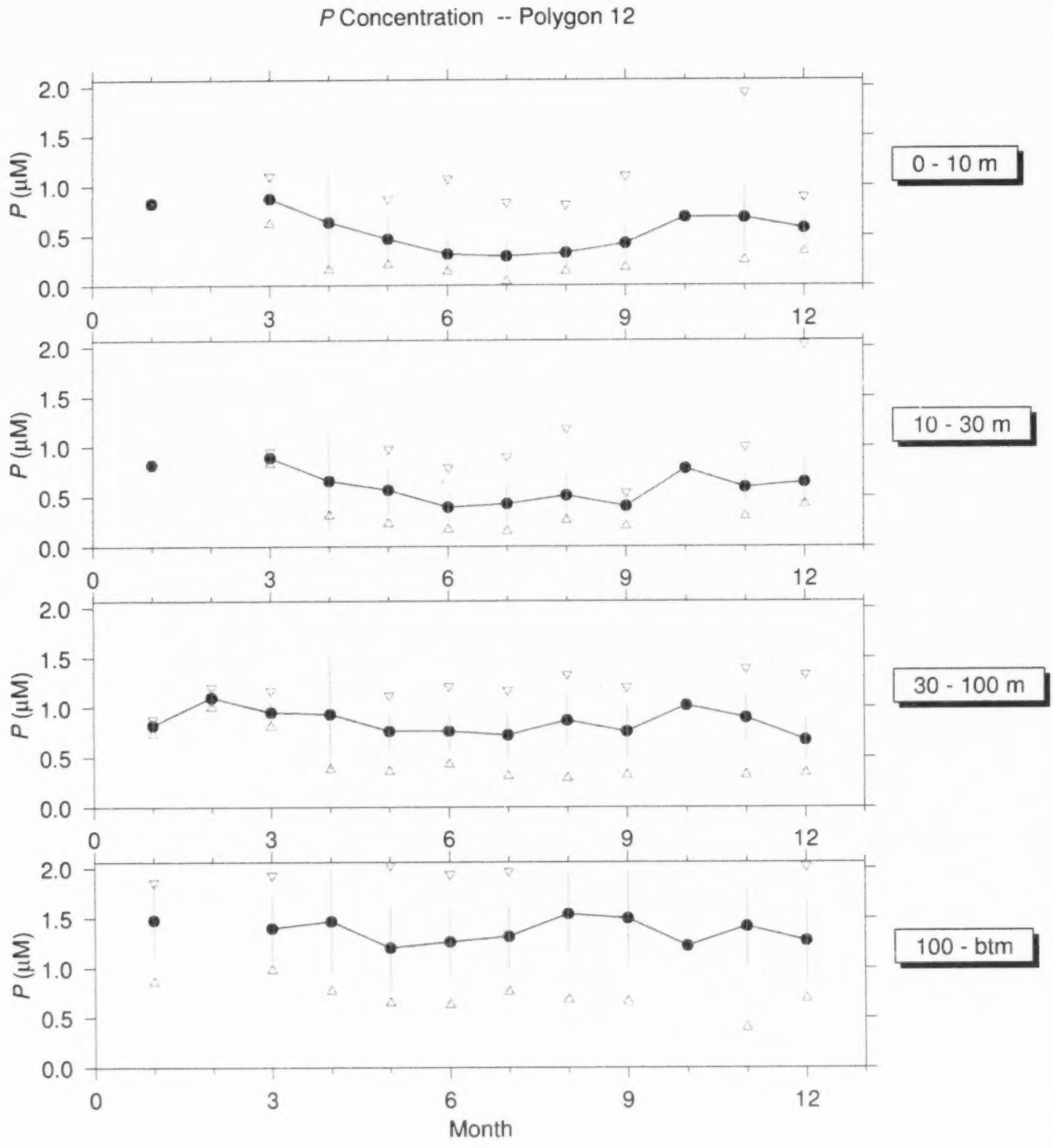

Figure 98: Timeseries of average phosphate concentration (μM) for four depth intervals for polygon 12. Vertical lines are $\pm$ 1 s.d.: symbols show the range of values.

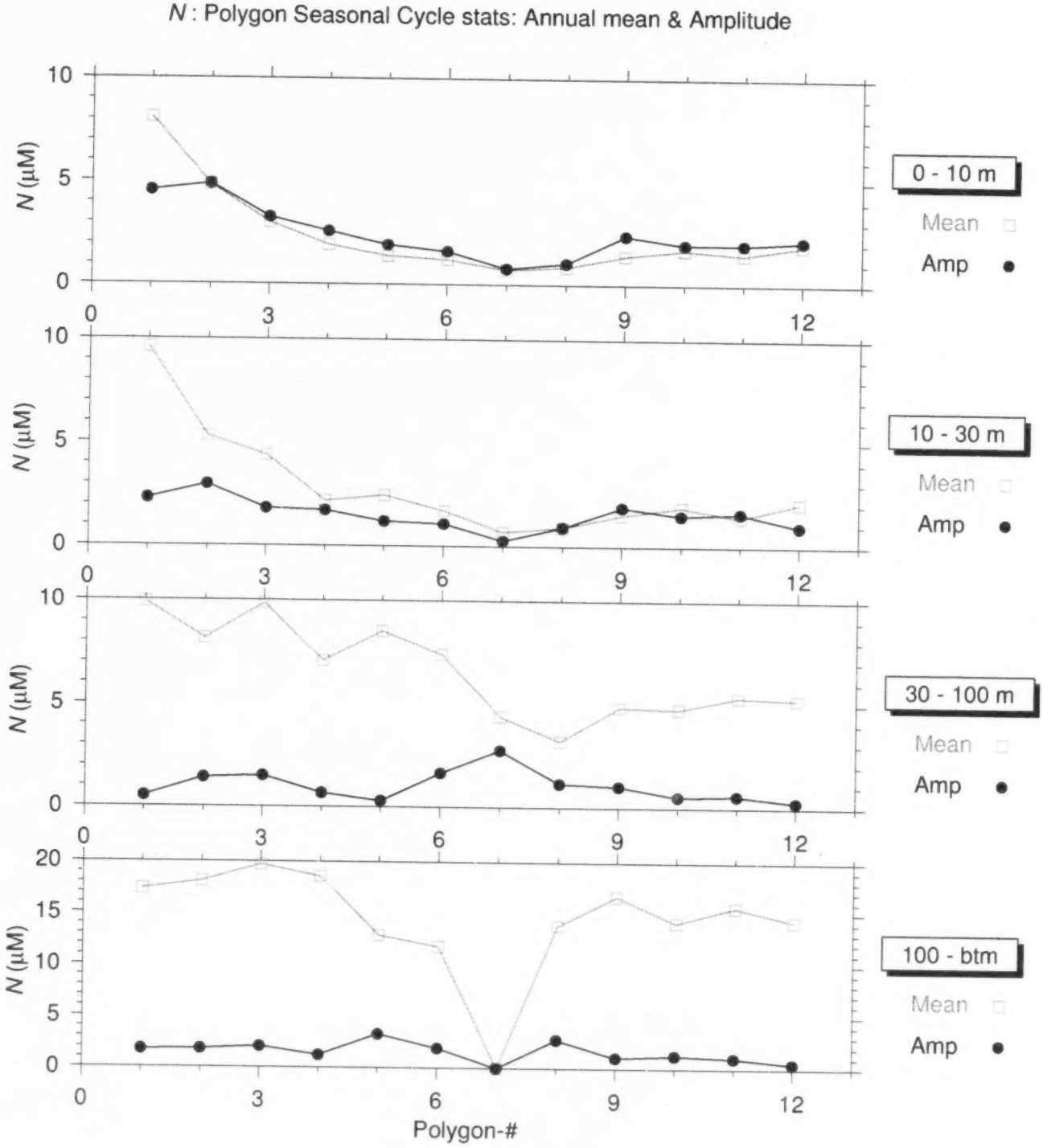

Figure 99: Nitrate: Annual mean and amplitude of the seasonal cycle versus polygon-#, for various depth intervals.

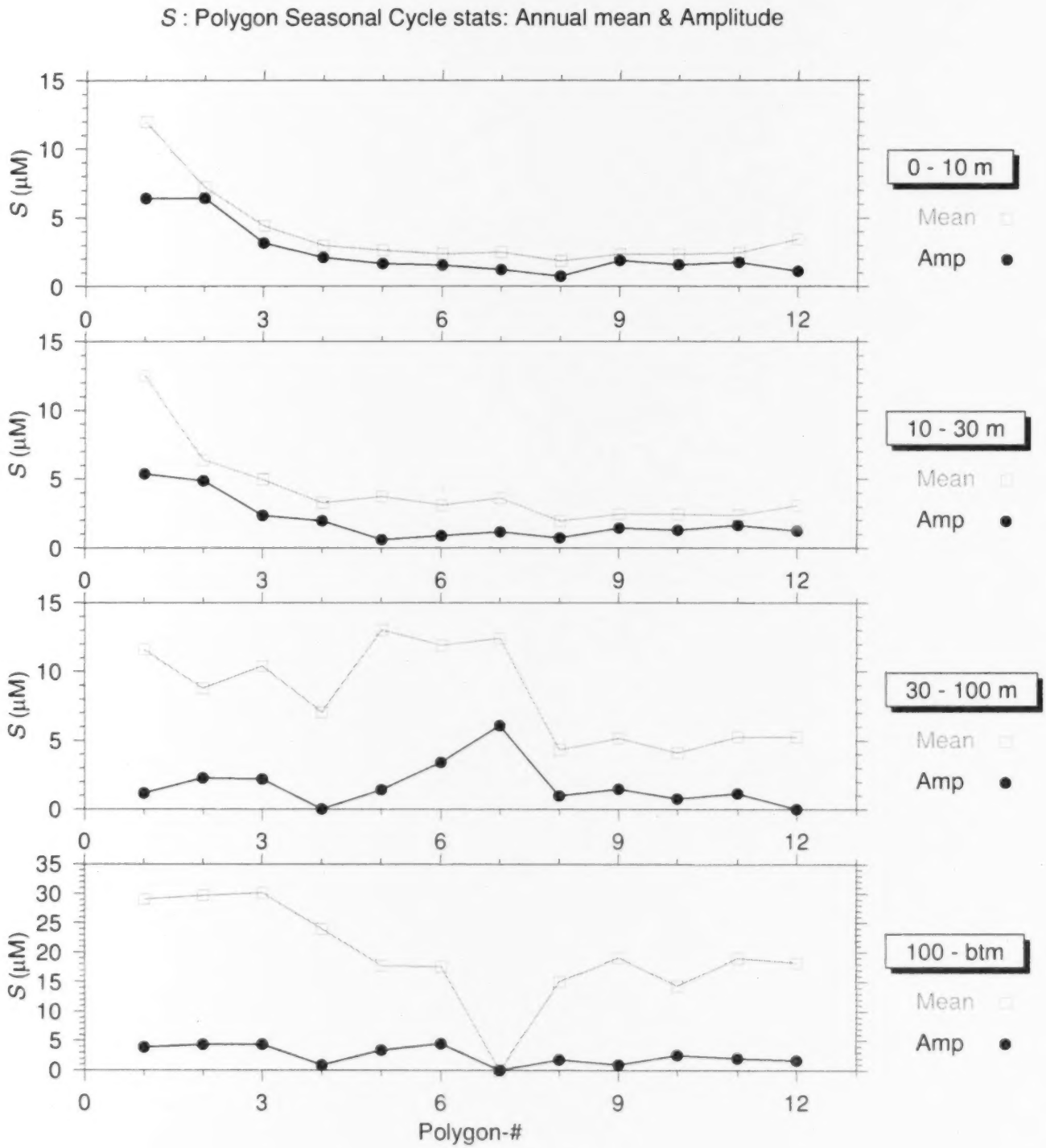

Figure 100: Silicate: Annual mean and amplitude of the seasonal cycle versus polygon-#, for various depth intervals.

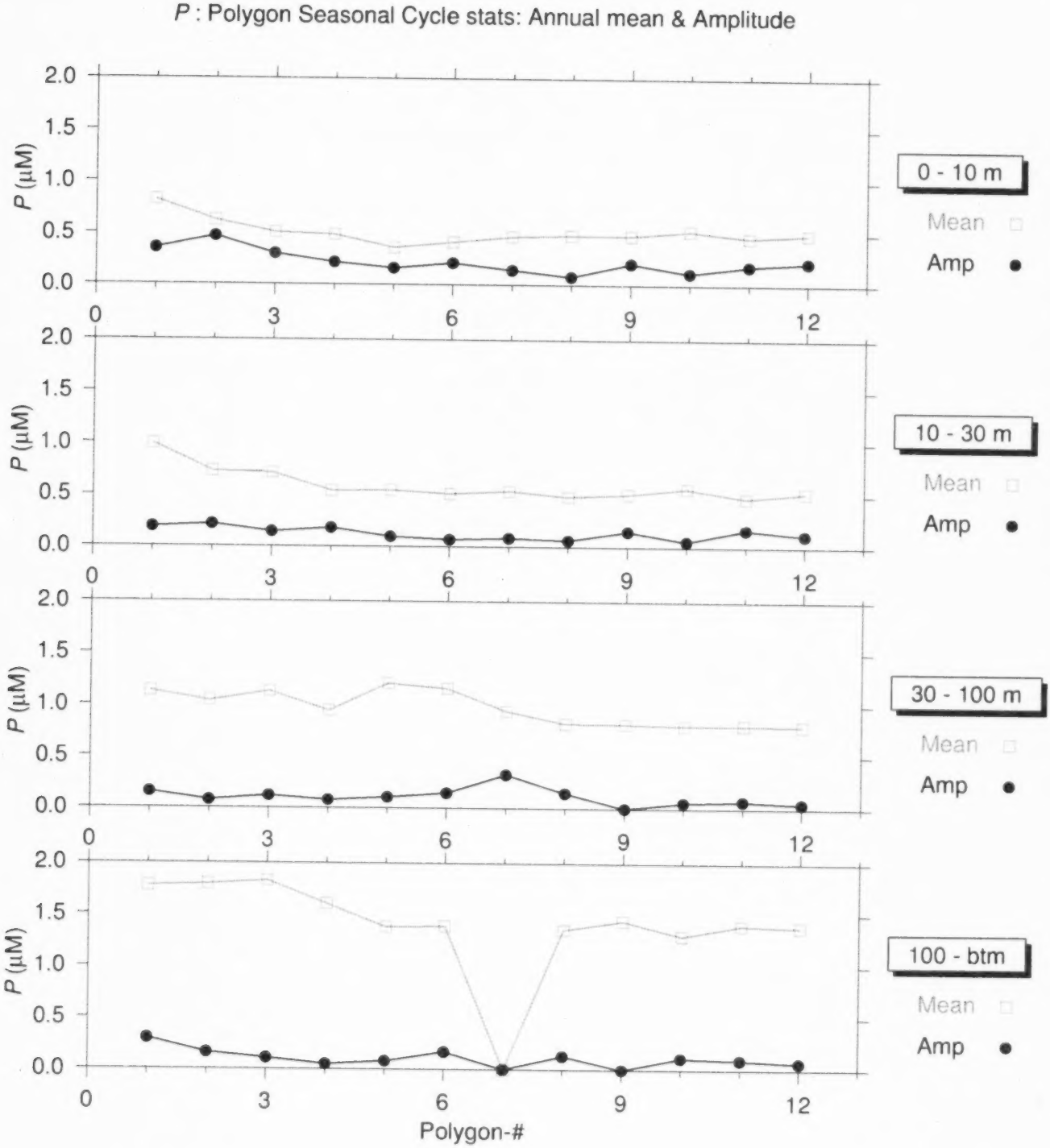

Figure 101: Phosphate: Annual mean and amplitude of the seasonal cycle versus polygon-#, for various depth intervals.

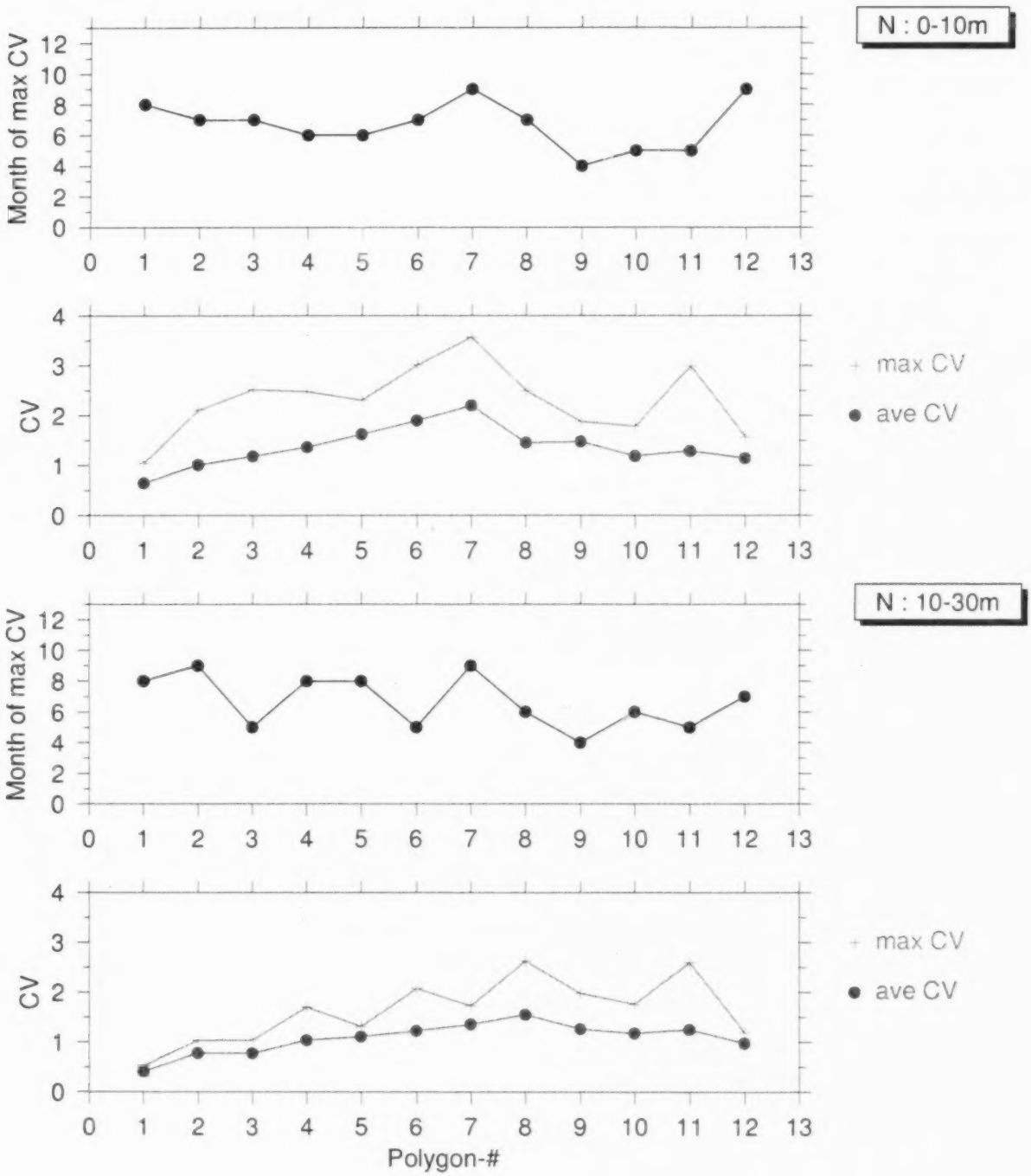

Figure 102: Nitrate: Month of maximum CV, maximum CV and annual average CV versus polygon-#, for depth intervals 0-10m and 10-30m.

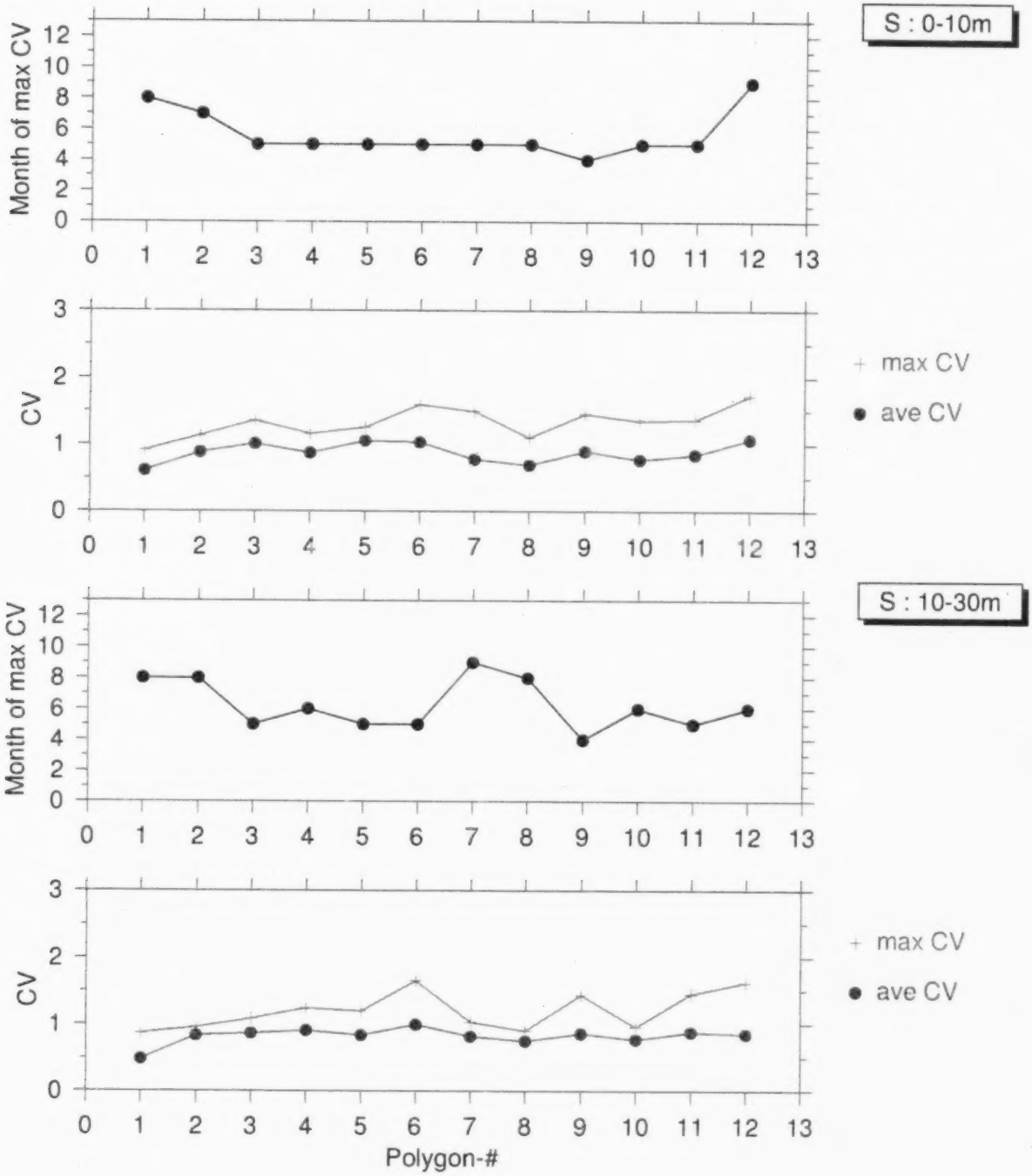

Figure 103: Silicate: Month of maximum CV, maximum CV and annual average CV versus polygon-#, for depth intervals 0-10m and 10-30m.

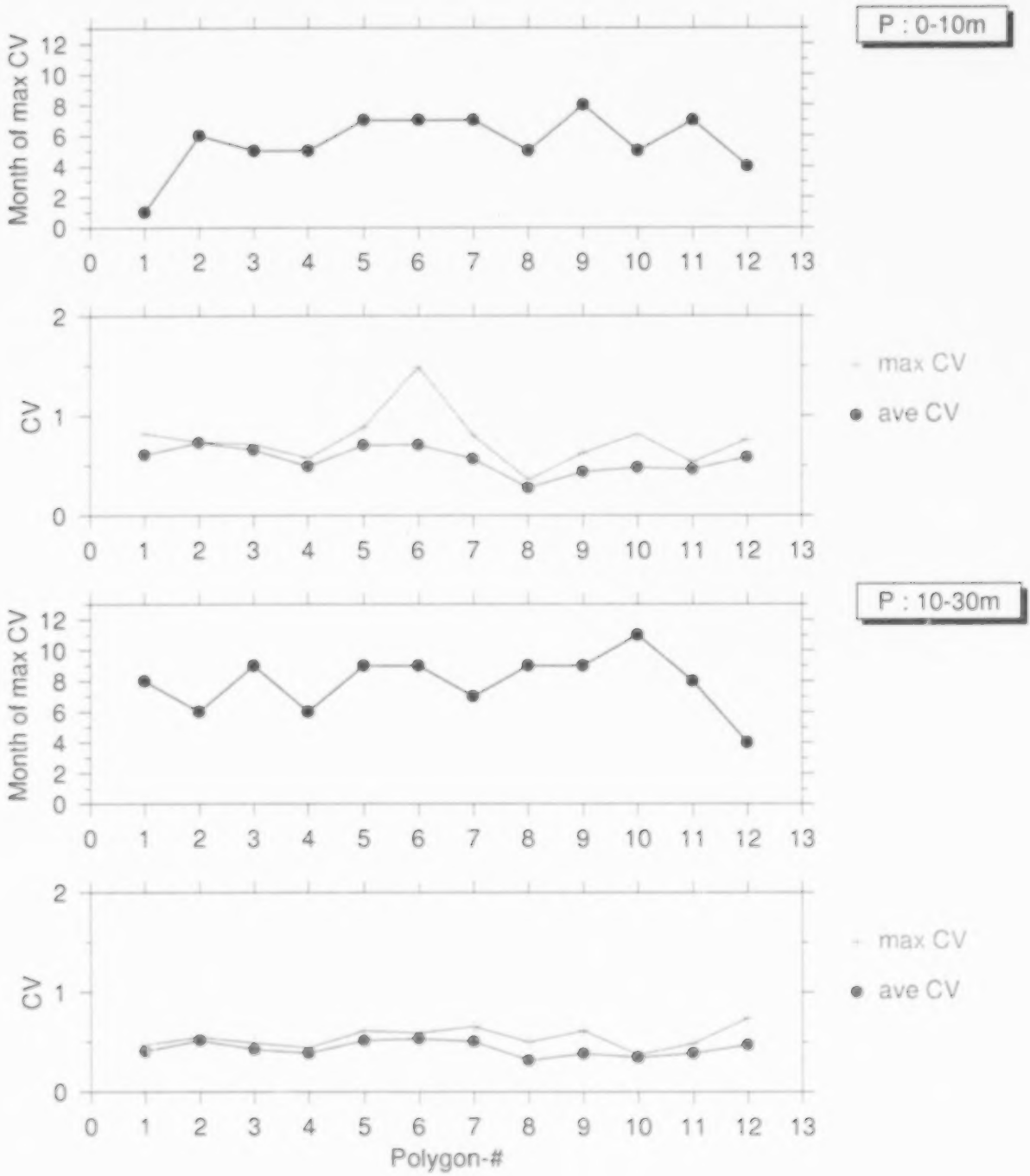

Figure 104: Phosphate: Month of maximum CV, maximum CV and annual average CV versus polygon-#, for depth intervals 0-10m and 10-30m.